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EDITORIAL NOTES.

The Selection of Directors—Mr. Carnegie on the Promotion of the Fittest.

MR. ANDREW CARNEGIE, in his rectorial address to the University of St. Andrews last Wednesday, gave expression to some interesting opinions upon matters industrial, as to which no one has better qualifications to speak than the man who has made so huge a fortune as Mr. Carnegie by the successful management of industrial undertakings. One of these opinions confirms in unqualified manner the views recently expressed in the "JOURNAL" upon the subject of company directors, particularly in regard to the question of how these should be selected. Now, our view is that the directors of an industrial concern ought to be men who have displayed exceptional ability and acquired thorough knowledge and experience in the service of that concern, or of another engaged in a similar line of business. When setting out this view as forcibly as possible, we challenged readers to advance any objections to the plan of promoting officers to be commanders in the industrial as well as in the military world; but the challenge has not so far been taken up. We should like to think that silence meant more than indifference on the part of many; acceptance by perhaps a few other than those already of the same way of thinking. But we know only too well that much water will run from mountain to sea before the day comes when the "you scratch my "back, I'll scratch yours" guinea-pig—the half-pay officer, the impecunious lord, the superannuated official—will no longer find gentle and by no means ill-paid occupation in "directing" business with which the clerks in the counting house are far better acquainted.

Nevertheless, since he who would see any reform effected in this slow-moving world of ours must be prepared to drop water on the stone, in season, and sometimes out of season, without troubling over-much whether the impression made is visible or not to the immediate eye, we thankfully call in Mr. Carnegie as a witness on our behalf, and take the opportunity afforded by his address of again pressing the reasonableness of our view—the necessity, indeed, of its adoption, if undertakings, such as gas-making concerns, exposed daily to a fierce and growing competition, are to achieve anything more than half-success, if they do not actually fail ignominiously. Mr. Carnegie has no doubt at all about the matter. "The great secret of success in business and millionaire-"making," says this ultra-successful millionaire, "is to "make partners of valuable managers of departments." As we have said before, one of the most successful enterprises in Great Britain that we know of at the present day has for its directors six men—the two original partners and the heads of the four principal departments. Four directors are, therefore, always "on the spot," at the very heart of things, knowing all the purchasers from, and sellers to, the business, able to oversee the working of the employees and to pick out the most capable for advancement—able, in short, to promote daily the best interests of the concern.

This management by employees promoted to be partners, while one of the principal factors in the success of the business we have in mind, is backed up, we should add, by another piece of wise policy. All the principal hands are shareholders, and they are, further, paid partly in accordance with results. In other words, profit-sharing is practised, and the men are part proprietors. Here, again, Mr. Carnegie's advice chimes in harmony with that of most other successful men. "Employers would find it much to their "interest to give to their ablest employees shares in the "business. . . . It is not the lowest, but the highest "paid labour, with scientific management and machinery, "which gives the cheapest products"—scientific management, of course, including the management that goes the right way to work to get value for money.

Into Mr. Carnegie's prophecies as to America's and Britain's relative positions in the world of commerce in the future we cannot here enter, and must take leave of his very interesting address after making one more quotation, that puts in true epigrammatic form what we all know too well, and are, or should be, all striving to remedy. Comparing the advantages possessed by Britain and America over each other in the commercial conflict, Mr. Carnegie says, of this country, that employers are not so wholly devoted to business, do not give to it such unremitting attention, as their competitors in the States, while "*the employed think too much "of how little they need do; too little of how much they can do.*" We will not spoil that by any attempt to enlarge upon it; our only comment being, that the firm that can make the pregnant saying inapplicable to its employees will win for itself a lasting and conspicuous prosperity.

The Controversy on Municipal Socialism.

AT last the fuglemen of the Progressive Party appear to have decided upon the line they will take in regard to the damaging exposure of municipal mismanagement and extravagance which "The Times" has been instrumental in giving to the world. In the "Daily News" of yesterday week, there was a long rigmarole laboriously put forward with the object of making out the whole thing to be the outcome of a "monstrous intrigue" gotten up between the management of "The Times" and an organization of capitalists interested in electrical investments, with the name of the Industrial Freedom League. This alleged explanation of the genesis and inspiration of the articles was set out with much pomp and circumstance; and a great parade was made of the names of the conspirators, who were asserted to have captured "The Times," and also the "Encyclopædia "Britannica," in the course of their nefarious plot against the municipal life of the whole country. It is hardly necessary to remark that no further attempt was made to disprove one of the numerous counts in the indictment of Municipal Socialism which it was sought to disparage by this artless device. Anything of the kind was presumably regarded as unnecessary, so long as it was possible to drag in the "Trusts" bogey to alarm the British public in regard to the possible eventuality of the country being precipitated towards "a hideous convulsion in which the people will be "ranged on one side and wealth on the other." Unfortunately for the success of this very familiar device of small politicians confronted with a disconcerting record, the same day that this announcement of the discovery of so portentous a mare's nest saw the light, also brought from the writer of "The Times" articles a simple statement to the effect that the plan of his work was laid out by himself fully two months before the Industrial Freedom League came into existence. Thus, on the mere point of dates, the ingenious edifice of the "Daily News" crumbles to pieces.

As we have already observed in these columns, however, the suggestion that municipal trading alone is on its trial at the bar of the instructed public opinion of the country, is not an adequate view of the present situation. It is only a certain order of municipal enterprises that can be classified as fraught with particular interest for the clique of capitalists whose most conspicuous representative is Mr. Emile Garcke, with Mr. Sydney Morse as a good second. These gentlemen are very well able to look after themselves, and do not need defence in the pages of this or any other independent journal. What is in question is precisely what such apologists as the "Daily News" carefully ignore—the very real, though not necessarily formal and avowed, conspiracy between Socialistic and Labour wire-pullers and parochial politicians to exploit the whole field of local self-government in this country in the interest of a class. This being the root question, it is sheer trifling with the issue to talk about the Industrial Freedom League, or the Pierpont Morgan Trusts, as mattering one jot in the same connection. It is needless for us to protest that we have no love for the Garcke-Morse combination or its works. They made trouble enough years since, when they were identified with Brush electric lighting. The American methods of these very alert and determined gentlemen were very far from

commanding the respect of those for whom the "JOURNAL" is published; and we had enough to do for many years to combat them at every point. But let every man have his due. These Brush agents did set things moving, and keep them so. They were at first only a few among many hardy navigators over unknown seas, who set their sails to catch the breezes of the electric lighting movement. They had a rough time of it; but they did not go under, like most others. Many of their contemporaries of those days have disappeared altogether, and their very names can only be recalled by an effort of memory. The Brush people, almost alone of their kidney, knew how to successfully transfer their fortunes from lighting to the power and traction branch; and at a time when the backwardness of English mechanical engineering in the electric branches became a byword, the reorganized Brush interests were found "at home" in Britain when the new conqueror, George Westinghouse, came over. Platform and arm-chair politicians should remember that it is impossible to have it both ways. There is no sense in praising American enterprise at home, and condemning its acclimatized form over here. It so happened that the line of business taken up by the new Brush interests necessarily brought them into competition, and occasionally into conflict, with our municipalities. That they should fight for their own hand whenever compelled to do so, and in their own fashion, is not to be imputed to them for a fault.

How far the cock-and-bull story of the "Daily News" is from disposing of the rising agitation for reform of British municipal methods and doings can be seen by the fact that the latest of "The Times" articles do not deal with any of the matters with which organized traders are concerned; but with the pressing subject of housing and rehousing. This is a thing which stands apart, as a problem for Parliament to deal with afresh at the earliest possible moment. Railway companies, gas companies, and, in short, any and every interest that has to do with the compulsory acquirement of sites occupied by "persons of the labouring class," as the Standing Order has it, must feel the need for a thorough revision of the law of this matter. Not the least of the mischief of the existing state of affairs in this regard is due to the relinquishment by local authorities of their original and proper status of controlling and inspecting powers, in order to become landlords and lodging-house keepers on their own account. One of the most valuable of the many points of experience gathered by municipalities that have already gone into the housing business, is the indication supplied in some localities that the principle which restricts communal enterprise in the commercial direction is no figment of an antiquated polity, but a real guide to governmental action. The principle is that "municipalities ought not to "undertake to supply a public want until it is clearly "demonstrated that the ordinary social, commercial, and "industrial machinery is incapable of doing the work "efficiently under proper and vigilant municipal super-"vision." It will not have been forgotten that Parliament has always acted upon this principle in regard to the coveting of gas companies' undertakings by local authorities. A gas purchase scheme, promoted simply and solely on the ground that the local authority would like to possess the property, has no chance of securing the approval of Parliament, if resisted on the score that it is mere covetousness. Putting aside, as "The Times" remarks, all theoretical and political objections to municipal trading, this principle rests upon a sound business basis. It is common experience that business enterprises are never so efficiently and economically managed by a National Government Department or a local authority, as by men who are directly and personally interested in their success. The basis of this conclusion is in human nature. One might go further, and argue that just so far as the ordinary incentives and checks of competition are removed from certain kinds of business, for particular reasons—as, for example, in the case of statutory railway and gas companies in Great Britain—so inefficiency is fostered and condoned. It is, no doubt, quite possible to point out exceptions to this as to most general rules. In the case of municipalities, there are some which, by favour of having a good class of citizens available for their work, contrive to do such universal services as water supply in an unexceptional manner. As soon as we pass from the case of a universal service to one in which only a portion, or a class, of the community are interested, the objection to municipal interference with the ordinary course of supply and demand becomes proportionately magnified. Municipalities which abandon their proper work of control and supervision, and grasp at every trade which in private hands is showing a profit, are rushing headlong into a region of economic disorganization from which spring evils tenfold greater than arise even from wholly unregulated private enterprise. There is no getting away from this conclusion, which might be sustained by much cogent argument that could not be repeated here. The one word "inspection" is enough to show a light over this line of country. Where a local authority does not control, but trades, it must itself be supervised by some Government department; and the slowness, wastefulness, and obstructiveness of Government offices constitute a byword.

The Free Labour Association.

THE announcement that the delegates to the National Free Labour Association Congress had duly met in Leeds and transacted business usual and proper to be done on such occasions, did not create a noticeable ripple of excitement last week on the surface of the tide of human affairs. This apathy on the part of the general public to the doings of Mr. J. Chandler and his associates is susceptible of various interpretations, some complimentary to their organization, others very much to the contrary. Really, the relative insignificance of this particular gathering among the many conventions and congresses that interest and amuse different sections of the English people year by year, is nearer to scale than the exaggerated publicity accorded by some newspapers to the Trade Union Congresses. The saying that the world is apt to take people at their own valuation is never better exemplified than it is in the case of the Trade Unionists, whose pretension to represent the working class, while, as a matter of fact, they have a following of only one in ten of the order, is commonly accepted as well founded. It is notoriously more difficult to organize majorities than sections. Moreover, there is something like a contradiction in terms in the name of the National Free Labour Association. Freedom to work, one would naturally be disposed to think, goes with liberty to eat, breathe, or walk about in the King's Highway. For some such reason as this, the general public or people who also mostly earn their own living in their own ways are not disposed to take seriously this particular organization of the unorganized. Yet it is a Society devoted to, and representing in a particular sphere, a highly meritorious cause. It aims at meeting militant Trade Unionism with its own weapons, so far as these are lawful; and it has been surprisingly successful in beating class tyranny at its own game. In theory, no such organization should be necessary in a free country; but in practice it is found extremely useful. Without such a nucleus as the Association provides, employers taken at a disadvantage, and without any means of common action, would be much more at the mercy of the Labour agitators than they need be, if they know how to make use of their advantages. A good deal has happened of late years to teach employers and free labourers the weighty truth that the liberty of the subject is an abstract idea which cannot always be materialized at need in the interest of individuals. It has to be supported by something rather more formidable to disorderly persons than the solitary policeman who is ordinarily quite adequate for representing the majesty of the law. When Labour Unions were made free of the criminal law, those who did not believe in such organizations should have forthwith concerted countervailing measures for their own protection. The danger was not very apparent, however, and nothing of the kind was done betimes. The lesson has since been learnt through painful experience; and now such incidents as the abortive Llanelly firemen's strike teach even the most headstrong among the labour agitators that "organization" is a game that two or more can play at. The existence of the National Free Labour Association is further proof of the same character.

Municipal Corporations and Water Gas.

THE Association of Municipal Corporations are again turning their attention to the question of the supply of carburetted water gas—this time in connection with the Bill that has been introduced in the House of Lords for the "Regu-"lation of the Supply of Water Gas and other Poisonous "Gases." Pursuant to a notice standing in his name on the *agenda* for last Wednesday's meeting of the Association

in London, Mr. G. C. Kent, the Town Clerk of Longton, moved that the Bill should be referred to the Council, in order that it might be thoroughly examined by them, and any necessary amendments in the interests of Corporations secured. The motion was seconded by Alderman Miles, of Bolton, and carried without discussion. The Gas Companies' Protection Association have already shown that they are fully alive to the seriousness of the restrictive proposals of the Bill; and, as readers of the "JOURNAL" are aware, they have determined to approach the Board of Trade on the subject. It will be curious to see the attitude that the Municipal Corporations will take in this matter. Unlike the Gas Companies, who have no interest whatever in the supply of carburetted water gas beyond that of manufacturers of a commodity of public utility, the Municipal Corporations of the country are divided in their views, which, we fancy, are shaped more with regard to their situation in relation to the gas supply than prompted by conscientious or other motives. The gas-supplying municipality could well, over this subject, join forces with the Gas Companies' Protection Association; but the municipality whose area is served by a gas company will easily persuade themselves that it is a sacred duty to do their utmost to support the Earl of Dudley's measure—though the real reason may be other than the public interests. We cannot imagine the London Municipalities, headed by the London County Council, and the Liverpool and Dublin Corporations, regarding the Bill with the same ill-favour as the Manchester, Birmingham, Edinburgh, Leicester, Belfast, and numerous other Corporations will do. And why not? Is it that the London, Liverpool, and Dublin Corporations have a finer and more majestic sense of their duty to the public than the latter, or is it that it happens that the gas supplies in those cities are not under municipal control? The line dividing those municipalities who will support, and those who will oppose, the proposed regulation of the supply of water gas could, we venture to assert, be drawn with no uncertain hand.

For these reasons, it will be interesting to watch which way the vane of the Association will be blown over this question. Mr. Kent did not supply, in proposing acceptance of the proposed reference to the Council, any idea as to his own views on the matter. But, as Town Clerk of Longton, the Corporation of which town are the possessors of carburetted water-gas plant, he cannot be other than entirely opposed to the drastic measure of regulation and prohibition proposed; in fact, the words he used in putting his motion—"and any necessary amendments in the in-"terests of Corporations be secured"—are evidence of this. It may be remembered that in June, 1900, Mr. Kent was successful in passing a resolution at the Dublin meeting of the Association, by which the Board of Trade were urged to promote legislation at the earliest moment to carry out the recommendations of the report of the Home Office Committee of 1899. His reason for doing this was the practical one of letting gas suppliers know at the earliest possible time their exact position in reference to the manufacture and distribution of water gas, and to remove the deadlock that the report in question had produced. Mr. Kent's idea of legislation in 1900 can hardly have found embodiment in the Bill that has been introduced by Earl Dudley; and we fancy that, in order to make it conform, Mr. Kent, or those he serves, would like to see some very radical changes made in it. Taking all things into account, it is to be feared that the Council of the Association will find the reference a somewhat difficult one. At all events, whatever may be their findings and recommendations, they will certainly not please the whole of the membership.

The Coal Outlook.

IN the United States the miners who have been out on strike are gradually settling down to work again, although, as we anticipated, the trouble so usual after a big strike—the question of the non-Unionists who have been taken on during the stoppage—is being experienced in some districts, and may prevent an early return to a full output. It is not, however, very likely to cause another serious stoppage. In France, the miners' strike still drags on, and has been complicated by trouble with the dockers at the coal-unloading ports. Up to the present, however, the ample stocks on hand have prevented the strike having the effect upon the English markets that a serious shortage in France would have; and it is to be hoped—there are grounds for hoping—that the trouble will be brought to an end before coal really becomes scarce there, and our collieries begin to feel its full force. So far, therefore, as foreign labour troubles are concerned, the situation, looked at from the coal consumer's point of view, while far from being so favourable as could be wished, is not by any means so depressing as it was a fortnight or so back; and the coal market during the past week has reflected the brightening of the horizon. Buyers are, in the main, fortunately exercising restraint, in the hope of an improvement—an attitude that always helps to hasten the coming of a break if one be on the road. This non-commital policy finds much support in a consideration of the position of business at home, and the probable state of affairs that would be brought about by a cessation of the adverse influences of the foreign markets.

Everything in the condition of the home trade points to the probability of there being, in the near future, a more general slackness than has been experienced in any year since 1897—a slackness that is only temporarily warded off in some degree by the influence of the industrial "boom" in America. The Labour Department's returns show a marked increase in the percentage of members of Trade Unions unemployed, partly due, of course, to the return of reservists from South Africa, but also due to a decrease in the volume of work in hand. The outlook is especially dismal in the shipbuilding trade; and the only remark that those who have been watching matters in the ship making and using worlds during the past two or three years can make in regard to the present position is, that the wonder is that the fat years have lasted so long. The need of ships for transport purposes during the Transvaal War certainly did much to ward off the "slump." But that abnormal impetus is rapidly dying away; and the output of ships in recent years has been so stupendous that the glut was bound to come, and come it has. Berth after berth in the shipbuilding yards is being emptied, and orders to lay fresh keels on the stocks are to seek. This, and the fact that in the general engineering trades orders are running out in many branches rather faster than others are coming in, must in the months to come exercise a depressing influence upon the iron and steel trades, and through them upon the coal market. Moreover, so far as the influence of foreign markets is concerned, it must be remembered that trade in Germany is at present in as depressed a condition as that in the States is active; and although the one is not a complete set-off against the other, the eagerness of German manufacturers for orders is bound to counteract a great deal of the stimulus given to British trade by the "iron famine" in America.

The moral of the situation for the coal consumer appears to us to be that he should be very careful not to commit himself, except upon the most favourable terms, in regard to any requirements beyond those for this winter; and if he has any more purchases to make this side of the spring, not to be in too great a hurry about it, but to keep a watchful eye on passing events at home and abroad, so as not to miss opportunities of dealing on better terms than are at present to be obtained when everyone is pressing for the delivery of what has already been bought.

Ownership and Capacity of Railway Waggons.

THE contributions of Mr. W. F. Butler and Mr. W. B. Lampard on the great railway waggon question, which appeared in last week's "JOURNAL," are doubly welcome. In the first place, they constitute very valuable matter tending to the elucidation of a peculiarly complex subject; and, secondly, they bear witness to the willingness of some, at any rate, of those whose connection with the gas industry is of another kind than works engineering and management, to lend their aid to the discussion of debateable topics bearing upon the conduct of the industry. We have always thought, and still think, that much of the regrettable feeling that arose in the past between the professional and the commercial elements in the following of the industry, would not have occurred if more of those able and alert gentlemen who belong to the latter division had always shown greater willingness in coming forward with their experiences and special knowledge to increase the available stock of information. To return to the immediate question, Mr. Butler is mistaken in supposing that we were not alive to the weak side of the original letter of "S. R. B." to "The Times" of Sept. 22, on which our article was founded; the fact being

that we purposely took his statement of the case as a means of provoking further controversy, if possible in our own columns. The expedient has fortunately proved successful; and with this we are so far satisfied. It must strike any reflecting observer of this country's trade methods as somewhat singular, that such a matter as law relating to the provision of railway waggons touches so closely, and at so many points, the very life of our greatest industries. In many of the industrial and mercantile affairs of the world, the considerations that really signify are not those lying on the surface, and made the subjects of public comment and newspaper discussion. Trades rise and decline, manufactures migrate and change their character, in submission to influences never suspected by outsiders. Thus, to name only one, albeit the most striking, of such experiences, some seaports and railway centres wax at the expense of others, certain industries flourish better in particular localities than in others.

The legal position now occupied by railways in the United Kingdom is unique, as Mr. Butler points out. Whether for good or for evil, the use of British railways in regard to the carriage of merchandise differs from that of every other railway system, in that any person has an indefeasible right to run his own vehicles upon every one of these lines in consideration of paying the tolls leviable on the traffic, and conforming to certain regulations. This right of the public to the use of the railways is only called into question at the present juncture in respect of the suggestion that its existence stands in the way of such a general improvement of the railway transportation service throughout England as has been brought about (say) in the United States, where another condition now prevails. With all due deference to Mr. Butler and Mr. Lampard, it cannot be agreed that they have as yet done any more than offer excuses for the actual state of affairs. It is not necessary to take seriously all that "S. R. B." advanced respecting the alleged inferiority of privately owned waggons, as a class, in order to hold to the opinion on the general question that if the settlement of the railway status had to be made over again, a different arrangement would be preferable. Observe, we do not say that this is our opinion, but only that neither of our correspondents controverts it where it may be held. In a sense, the general question resembles that of the occupation of the subsoil of highways by a miscellaneous assortment of pipes and cables, all in different private ownerships, with the distinction that the highway does not itself belong to anybody while the railway does. The analogy must not be pushed too far, of course, or it will break down. Lastly, the prospect we had in view in preparing the article was that it might be found expedient for the service of some inland gas undertakings that set trains of waggons should be made up and kept running between their works and the collieries. If so, what capacity of waggons would be most suitable? Mr. Lampard thinks that 15-ton units might be best. This is the question that remains open for the present.

Payment under Protest of Disputed Rates.

In financial matters, local authorities enjoy many advantages over private individuals; but to argue that it is legally impossible for them to return money received which is subsequently proved to be in excess of the sum they were entitled to demand, is construing very liberally the powers they possess. If such a contention were well founded, then the sooner the law on the matter was altered the better it would be for everybody. Certainly, a local authority ought not to be debarred from performing a simple act of justice like this; and if they were, we should expect to see them doing their very best to secure the removal of the disability. The most effective way of preventing such local authorities as might wish to do so from putting forward this excuse, is to pay them only money to which they are without any doubt entitled. Companies and other large ratepayers who have appeals regarding their assessments pending, would, however, naturally consider themselves safe if they paid the disputed rates under protest; but a case in which the Hampton Court Gas Company were last week involved should prove a warning to them in this respect. The "fault" of this Company was that, after their assessment was increased and they had given formal notice of objection, they continued until the settling of the appeal to pay rates based on the higher assessment; whereas the best thing for them to have done would have been to pay on the old assessment pending the adjustment of the question of increase. In consequence of their action, they have been put to a great deal of trouble and expense, which they might have been spared if they had meantime refused to trust the Overseers of East Molesey and the Molesey Urban District Council with the sum chargeable for rates on the increased assessment. Others will, however, doubtless profit by the experience of this Company, and will keep in their own hands all money the right of local authorities to which has not been definitely settled.

At the quinquennial valuation in 1900, the Hampton Court Gas Company's assessment was raised in the East Molesey district from £421 to £861; and notice of appeal was promptly given. To make matters doubly sure, a second notice was served two months later; and then the Company, at the urgent request of the Overseers and the Council (who said they could not adjust their accounts until the full amounts were received), paid their rates on the new scale. After this, the representatives of the Company met the valuer for the Assessment Committee, and arranged with him, so they said—though it is only fair to point out that Mr. W. G. Cooke, the valuer in question, denied that any such agreement was come to—that the appeal should stand over until the assessments for the other parishes into which the Company's property extends were completed. This was not done until last spring, when the assessment was again reduced to the old figure of £421. The Company thereupon refused to pay the next rates due, contending that the Overseers and the Council had money in hand which had been paid on the new assessment, and that they should either return this amount or place it to the credit of future rates payable by the Company. The Authorities declined to accede to this reasonable request, and summoned the Company before the Magistrates, who had no difficulty whatever in coming to the conclusion that the Company were justified in holding that the Authorities had money of theirs in hand more than sufficient to cover the rates due, and so declined to order payment. Indeed, the Chairman of the Bench plainly informed Counsel for the Urban District Council that he would never persuade the Magistrates that the money ought not in equity, and they believed in law, to be returned. What other opinion would have been possible on the facts of the case?

Next Year's Meeting of the Société Technique du Gaz.

Notices have just been issued by the French Gas Society informing its members that their next meeting will be held at Toulon, on May 12, 1903, and following days. The reminder is also given that papers proposed to be submitted for the usual competitive prizes should be sent in by Feb. 1; the date for the ordinary communications being April 12. It will thus be seen that the Société Technique du Gaz give early intimation regarding the sending in of papers to be read; and this, no doubt, largely accounts for the customary length of the annual list of technical contributions. Our anticipated new Institution might, perhaps, bear this in mind.

Recovery Coke-Ovens v. Gas-Retorts.

A very interesting communication on "Recovery Coke-Ovens" was made by Herr Hilgenstock, of Dahlhausen, to the recent meeting of the German Association of Gas and Water Engineers. An abstract translation of the contribution appears in another part of this issue; but we desire here to take an opportunity of specially calling the attention of readers to the paper, in case some may be inclined to pass it over as not very nearly concerning them. To do this would not merely be a mistake, but a serious one; for many of the statements made by the author are worthy of very earnest investigation at the hands of every gas engineer. Herr Hilgenstock commences by remarking that the consideration of the branch of industry which concerns recovery coke-ovens and its relations to the gas industry, covers two industrial departments which are indeed allied, but which have hitherto remained distinct, for only lately has there been observable here and there the feeble beginning of a coalescence. After referring to the recent efforts in America to supply towns with illuminating gas from coke-ovens (and which efforts, we would venture to remark, do not appear to have been uniformly successful), Herr Hilgenstock says the question which still requires to be settled

is: Are the gas-works to attach themselves to recovery coke-oven works, or are the latter to extend themselves into the gas-works? In the latest developments of recovery coke-ovens, he says, the charge in the long, narrow, and high chamber constitutes an elongated prism; and analyses show that it is possible in this way to produce an average gas from poor gas coal which is scarcely inferior to that manufactured at many gas-works. The aim has been to produce a clean oven gas, as the purity of the gas is responsible for the yield of the bye-products. As this object has been attained by constructing the chamber as mentioned, the charge in which is heated only from the sides—or in any case not at all from above—the author says it follows that the gas-works retort, as shaped and maintained up to the present time, cannot ensure a proper production of gas. Herr Hilgenstock lays considerable stress on the part played during carbonization by the moisture of the coal; and he has not the slightest hesitation in asserting that a modern recovery coke-oven produces more cheaply from the same gas coal more and better gas per ton than the gas-retort. The good gas is able to escape fairly unharmed within the zone of gasification in the charge of a coke oven up to the last (the maximum heat of the gas space being 930° Fahr.); whereas in a gas-retort, the good gas comes into contact with the hot walls of the retort till it reaches the outlet, and the whole of the gas attains the condition of that which can be produced from less good or less rich gas coal. This, contends Herr Hilgenstock, proves that the retorts should be replaced by suitable chambers. As gas-retorts, he says, have been regarded for almost forty years as the model for coke-ovens, so must the retorts in turn be modelled on the latter. There is plenty of food for reflection in the paper; and we trust that these few remarks will induce everyone to read it for himself, so as to form an opinion regarding the soundness of the author's views.

Electric v. Gas Lighting in Bermondsey.

The members of the Bermondsey Borough Council were evidently in a liberal-minded mood at their meeting last Tuesday evening, for they adopted, almost without a murmur, two estimates which will add considerably to the cost of the public lighting of the district. This question has been very much before the members of the Council lately, and, as shown in the "JOURNAL" last week, they have had some instructive comparative figures laid before them by the Borough Engineer (Mr R. J. Angel, Assoc.M.Inst.C.E.), in order to enable them to form a just estimate of the cost of the various systems of street lighting now available. As a progressive Borough Council, it is not surprising that they should be desirous of improving the illumination of their district by abolishing the old flat-flame burners The pity is that, in selecting a substitute, they should have disregarded the economy of the incandescent gas system so clearly shown by the particulars already alluded to. The Council, however, have an electric light undertaking, and, of course, they want to give it some work. Accordingly, when the Finance Committee proposed the extension of electric arc lighting, at an estimated outlay of £4185, and an annual cost of £1100, in nine streets now lighted, partly on the old and partly on the new system, for £267 19s. a year, apparently only one member was bold enough to point out that this extra expenditure, which, when the interest and sinking-fund payments were added, would make the cost about five times that of gas, would be likely to give rise to an agitation among the ratepayers. However, he was as one crying in the wilderness. The Council have spent a lot of money on the introduction of the electric light, and, as another member remarked, there was no drawing back. The estimate was made a charge on the capital account, as was also another of £1190, emanating from the same Committee, for substituting the electric light for gas in thirteen side streets. In this case the annual cost will be £384, against £263 now paid for gas. This is not so disproportionate as the other; but the lighting of the streets in question might have been greatly improved without even this increase.

Militant Gas Consumers.

The old idea of forming a Protection Association has been proposed for the purpose of remedying the grievances, real or imaginary, of the Manchester gas consumers. Such an Association will, it is true, furnish a good opportunity for the dissatisfied ones to air their complaints; but that any real good will arise from it we have not very much hope. We have seen these Associations before, and know how much "talk" there generally is about them, and how very little "do." Still, if the new organization of consumers is not likely to effect much good, it must, on the other hand, be admitted that there is small probability of its doing any serious amount of harm. Of course, there is just a possibility that the Association may prove an exception to the rule, and that the investigation of the causes of the complaints of high gas bills in the city may be undertaken in a really capable manner by professional men, and not in the amateurish fashion one is forced to expect. If this should prove to be the case, we are sure that no one will be more pleased than the Gas Committee, who, contrary to the opinions expressed by some of the speakers at the meeting held to consider the advisability of forming the Association, do not spend their time in endeavouring to rob their fellow-citizens. If the inquiry is to be effective, it will be necessary to do more than carry out the advice of "one of the highest chemical experts in England," who suggests that a good way of testing the rate of consumption of the mixed coal and water gas in Manchester would be "to have a small experimental meter and governor, which would cost about £5, and set it burning Manchester gas with an ordinary burner. Let it burn constantly for a few days, and then take it to a town where no water gas is used, and set it burning there for a few days and see the difference." Why, here surely is a first cousin to our old friend the wheelbarrow photometer!

And Electricity Committee Squabbles.

But, after all, the complaints of the Manchester gas consumers are as nothing compared with the disturbance which is going on with reference to the affairs of the Electricity Department. The speeches of municipal candidates form excellent occasions for the discussion of this matter, and full advantage is being taken of them for the purpose. The Chairman of the Electricity Committee (Dr. Bishop), at a public meeting a few days ago, remarked that to listen to all that was said about the Committee was "enough to make angels weep." It is. But if angels are so touched by the matter, what about the unfortunate ratepayers, who are very much more nearly concerned? Could not the Gas Consumers' Protection Association add to their sphere of operations an inquiry into the management of the Corporation electricity works? We venture to think they would find much greater scope for their energies in this direction than in that of the increased gas bills. In fact, if they are only going to deal with the gas supply, it seems hardly worth while to form an Association at all, for we have it on the authority of Dr. Bishop that "it will not be very long before gas lighting is knocked out." He says electric lighting is only a child in arms compared with gas; but it is "making rapid strides." There is something as much wrong with this simile as there is with the Manchester Electricity Department. It must, however, be granted that Dr. Bishop is a wit; for only just previous to making use of this brilliant metaphor, he had declared that Whitworth Street was "the drunken man's paradise, because one had only to go two paces to find a post to which to cling," and had expressed the wish that they would give him the chance of putting up the same number of posts for arc lighting. Verily, public affairs promise to be the reverse of tame in the near future in Manchester.

Loans for Public Works.

The twenty-seventh annual report of the Public Works Loan Board, issued last week, shows that during the financial year 1901-2 the Commissioners made 2003 advances for sums amounting to £6,650,021, the bulk of which (£6,511,482) was lent on the security of local rates, and the rest (£138,539) on property. In 1900-1, the total was £5,883,156 for 1684 advances. The interest receivable on the loans ranged from 2¾ to 4 per cent.—the largest proportion of the total (£4,297,584) being issued at 3¼. The average was £3 3s. 7d., against £3 1s. 10d. in 1900-1, and £2 17s., £2 15s. 6d., £2 18s., and £3 10s. 3d. in the four preceding years. The sum received in repayment of principal during the past financial year amounted to £1,720,645, compared with £1,488,979 in 1900-1. Of the former total, £56,234 was paid off by the borrowers before the amounts really fell due, against £28,645 so repaid in the preceding year. Rather more than half of the £56,234 carried interest at the rate of 2¾ per

cent. In one of the appendices to the report is a classified summary of the outstanding balances and the rates of interest payable thereon. Of the grand total of £42,000,325, a sum of £39,837,568 represents loans granted on the security of local rates, and £2,162,757 loans on property. The tabulated statistics show that of the total amount outstanding on the 31st of March last, 55·21 per cent. carries interest at less than 3½ per cent., whereas of the outstanding balance on the corresponding day last year, 48·86 per cent. carried interest at less than this rate, compared with 40·76, 24·21, and 8·51 per cent. on the corresponding day in each of the three preceding years.

The Carriage of Inflammable Oils by Railway.

Messrs. Carless, Capel, and Leonard, the well-known chemical manufacturers of Hackney Wick, are directing public attention, by means of a circular, to a decision recently come to by the Railway Companies which is calculated to seriously affect not only themselves and others engaged in a similar industry, but all who are concerned with the transport of articles of this character. According to the circular above referred to, the Companies have determined not to carry benzine, benzoline, naphtha, or other inflammable liquids, unless the senders sign a consignment note indemnifying them against "all claims for injury to person or property" arising directly or indirectly from the inflammable qualities of the goods, or from non-compliance with the regulations and conditions applicable thereto, and pay full compensation for all injury to their servants and damage to their property so arising, "unless it can be proved that the injury or damage is due to the wilful neglect of the company's servants." The above-named firm point out that this clause in the note enables any Railway Company to contend that if there should be any trifling and unintentional breach of the regulations—which, it may be mentioned, are of a very complicated nature, and occupy sixteen pages of closely printed matter—they can hold the senders responsible for any damage resulting, even if it should be directly occasioned by the carelessness of one of the company's servants. To be exonerated from this liability, "wilful" neglect must be proved; and this would be exceedingly difficult.

Who Should Bear the Attendant Risk?

The firm proposed to the Companies that the senders' loss should be limited, as hitherto, to the value of the goods themselves, or that accident following non-compliance with the regulations should render them liable to a penalty of £20, or even £50, for each offence. In making this proposal, they followed the precedent of the Explosives Act, 1875. But the Companies declined to consider it, and informed them that, as from Monday last week, they would not receive goods unless the consignment notes were signed without erasure or alteration. The firm replied that under no circumstances would they append their signatures with the objectionable clause retained; and they pointed out that the action of the Companies, if persisted in, must seriously injure a trade which had been carried on without accident, and to the advantage of both parties concerned, for upwards of forty years. It is believed that the imposition of such a liability on the senders of goods of the character in question as that expressed in the clause is absolutely unprecedented in this or any other country; and the authors of the circular suggested that the attention of Parliament should be directed to the matter. This was done last Wednesday by Mr. Scott-Montague, who asked the President of the Board of Trade if he was aware of the existence of the new regulations. Mr. Gerald Balfour replied that he was not; and he promised that if particulars were sent to him, he would consider whether the Board could usefully approach the Companies in the matter. It is to be hoped that he may be able to induce them to reconsider their decision, as the new regulations will certainly tend to check business.

The Halifax Gas Inquiry—Committee's Report Adopted.

There are a number of candidates seeking re-election to the Halifax Town Council; but, fortunately for them, in their meetings with the electors, they have not been heckled over the position of the gas-works quite so much as might have been expected. When, however, the subject has been broached, some of them have shown a disposition to cast it from them as promptly as they would a particularly hot potato. The words "*sub judice*" have possessed for them a blessedness and helpfulness such as they have never found in them before. Still one or two of the councillors have ventured into the matter a little way, while refusing to commit themselves too far. There is Mr. J. A. Drake, for example. He has not been afraid to refer to the matter, though he declined to be drawn to any great extent. It seems to be an axiom with him that public business should be treated on exactly the same lines as private business; and this not having been done in connection with the Gas Department is, he believes, the secret of the whole of the trouble so far as the loss of profit is concerned. If prices go up in the wholesale market, then they should rise in the retail department; and this appears to be exactly what has not occurred at Halifax. But this does not account for the second branch of the trouble—that the actual expenditure on the new works has (as shown last week) doubled the estimates. In this connection, the ratepayers will not regard with calmness the fact that (upon Mr. Drake's assertion) it is impossible to avoid further "terrible" expenditure during the next five years. The foundation has been laid for new and expensive work; and, if there is a likelihood of the undertaking paying, it will not do for the ratepayers to refuse to carry out that work now. As Mr. Drake picturesquely puts it, it would, under that specified condition, be a mistake to spend 10s. where 30s. has already been spent. Another member of the Gas Committee (Mr. Morley) has given the information that the additional members recently appointed by the Town Council to examine the Inquiry Committee's report have endorsed their findings; and he claims that this proves the Committee have conscientiously done their work, and in the interests of the town. A special meeting of the Town Council was held last evening "to receive the report of the Gas Inquiry Committee, and to pass such resolution thereon as may be deemed expedient." The Chairman of the Gas Committee (Mr. Wadsworth) moved, and Mr. Morley seconded, in each instance without comment, that the report be adopted. To this Mr. Brotherton proposed, as an amendment, and Mr. Alderman seconded, that the report be referred back to the Committee. The former urged that reasons ought to be attached to each conclusion arrived at, so that the Engineer (Mr. T. Holgate) could reply in a proper manner to each statement reported upon. However, on a vote being taken, the report was adopted by thirty votes to eight.

WATER AFFAIRS.

Protection of Sources of Water Supply.

It seems to be the fate of the President of the Local Government Board to have to devote a good deal of attention to the subject of water supply. This time last year he was in all probability supervising the preparation of the Bill to deal with the Metropolis, which is now in a state of suspended animation in the House of Commons, with a formidable array of amendments awaiting discussion when the measure comes up again for consideration after the Education Bill has been disposed of; for, notwithstanding all reports to the contrary, the Government do not appear to have any intention of abandoning it, and re-introducing it next session. However this may be, the temporary cessation of hostilities in connection with this question, which, after all, affects only a local water supply—a large one, it must be acknowledged—does not allow him to shelve the whole subject. To-morrow he will have before him one phase of it which is of national importance, for he has promised to receive a deputation representing the County Councils Association, the British Association of Water-Works Engineers, and the Sanitary Institute, who will ask him to urge the Government to consider the question of the protection of water supplies in England and Wales, with the view of instituting an inquiry into the existing state of the law thereon, for which they will contend there is pressing necessity. This matter has been so much to the front lately, in connection with meetings of the above-named bodies, that the objects sought to be attained are well known to those of our readers who are interested in water supply.

It is considered that the existing laws are defective, and that it is essential that provision should be made for the constitution of a controlling authority or authorities armed with powers to prevent water from being taken, without the sanction of Parliament, for sale outside a given area, to the detriment of local interests; also to check waste, and to

guard against the pollution of rivers and other sources of supply. On all these subjects much will doubtless be said which should merit the serious attention of Mr. Long. In the first place, it can be shown that the common law right of every proprietor to pump water on his own land may, under certain circumstances, be subject to serious abuse, if that right is exercised for purposes for which it was never intended. With regard to the checking of waste, no one, we think, will dispute the necessity for taking steps with this object in view, more particularly in respect of the uncontrolled waste which goes on in certain colliery districts. Finally, there is the all-important subject of purity; and as rivers and streams are the chief sources of water supply, it is in the highest degree necessary that they should be kept free from contamination. As it has been found from experience that the Rivers Pollution Act of 1876 has been practically a dead letter, there is room for fresh legislation, on the lines of that contained in the Acts of the Rivers Boards of Lancashire and Yorkshire.

This is not the only direction in which some alteration is urgently called for; the law defining the duties of local authorities in regard to water supply being admittedly defective. What appears to be greatly needed is some consolidation of the law governing water undertakings. Many inconsistencies exist in the Public and Private Acts and Provisional Orders under which various bodies now carry on their operations; and, in the general interest of the public health, it would be advisable to secure some kind of uniformity of action among them. How this may now best be secured, and the existing defects remedied, Mr. Long will doubtless be informed by the deputation.

A Year's Work in Liverpool.

The acknowledgment by Alderman Burgess, the Chairman of the Water Committee of the Liverpool Corporation, of a well-deserved vote of thanks by his fellow-members, at their last meeting for the present municipal year, afforded him an opportunity of reviewing their work during this period. We have on previous occasions borne willing testimony to the efficiency with which this department of the Corporation's operations is carried on; and the few details furnished by Alderman Burgess showed that it is being fully maintained. The Committee had 2210 more consumers to provide for in the city and suburbs alone; and they sent out upwards of a million gallons a day more than in the previous year, or more than twice the quantity estimated. A temporary falling off in the supply of water for trade and manufacturing purposes during 1901 was made up, and there was an increased demand for shipping. These facts indicate very strikingly the progress and prosperity of the port. Beyond this, something like 542½ million gallons of water—an increase of 48½ millions—were sold in bulk along the courses of the Rivington and Vyrnwy aqueducts. The Alderman was able to refer with gratification to the fact that the Committee had been at all times able to afford a constant supply of water throughout the whole of their area. Additional responsibility has been thrown upon them by the scheme for the supply of Wallasey, the works connected with which, sanctioned by the Local Government Board something like a year ago, were commenced in January last. Since then 14 miles out of the 31 miles of connecting-pipes have been laid. Six months later—viz., in July—a start was made with a second line of pipes from Vyrnwy, the completion of which as soon as possible is very desirable, in view of the growth in the demand for water in the city.

An important item in the work of the Committee in the past twelve months was the contest in Parliament over the proposal to purchase certain portions of the Rivington watershed for the protection of their sources of supply at that spot. The fight was a sharp one, as shown by our brief notes on the matter when it was before the Parliamentary Committee; but, in the end, the Corporation were deservedly victorious. The new Water Committee will have before them the important work of installing the water supply to Wallasey, the completion of the Cowny and Marchnant tunnels and the Prescot reservoir, and the construction of the second line of pipe from Vyrnwy. These works, as Alderman Burgess remarked, constitute a programme sufficiently full to satisfy the most voracious Committee; and we believe with him that they will have the same careful attention by the new one, as well as by the Engineer (Mr. Joseph Parry, M.Inst.C.E.) and other officials, which has made this undertaking so successful.

ESSAYS AND REVIEWS.

THE NEW PLAISSETTY MANTLE—A STRONG COMPETITOR.

In the Cantor Lectures which Professor Vivian B. Lewes delivered before the Society of Arts in 1900, on the "Incandescent Mantle and Its Use," he contrasted mantles manufactured by the Welsbach system and mantles made by such methods as those of De Mare, Knofler, Plaissetty, and Lehner, which, he stated, were clearly developments of the Clamond hood. He explained that, in the Clamond class, the filaments of the mantles "are made by squeezing a homogeneous pasty material through small orifices, so as to form rods or threads; and when the vehicle holding the salts is burnt off, the oxides are left in a thread of even density." To the alteration of the physical structure so produced, he ascribed "a most extraordinary effect upon the light-giving life of the mantle, and also upon its strength." Notwithstanding this high testimony of this latter type of mantles, little has been heard since; but a few months after the delivery of Professor Lewes's lectures, there was published the specification of an improvement in Plaissetty's method of producing the filaments referred to. Subsequently inquiries were addressed to the "Journal" office as to whether anything was being done in the development of the mantles; but at the time there was no information available respecting it. However, a few months ago, the Plaissetty Mantle Syndicate was formed; and to-day we are in a position to rectify the former deficiency of knowledge. Since the formation of the Syndicate, active preparation has been proceeding for the commercial exploitation of the mantle. Already a commencement has been made in producing it on the large scale; and a few days hence will see it taking its place among the competing mantles now on the market. From a careful examination into the methods of manufacture and of the performance of the mantle, its success may be confidently predicted. Professor Lewes, in the lectures from which quotation has been made, stated that "the new developments of the Clamond process form as important a step in the history of incandescent gas lighting as the discoveries which gave rise to the original mantles;" and the introducers of the Plaissetty mantle are convinced that its merits will confirm this unqualified assertion.

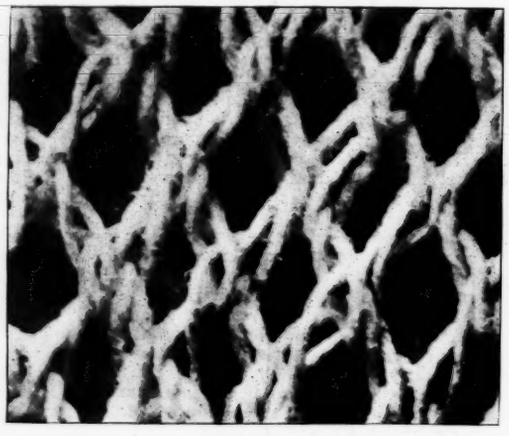
With this preface, we will proceed to a closer inspection of the process of manufacture; and readers will find the description of exceptional interest, in view of the fundamental differences in the new production as compared with the old. In the first place, the Plaissetty mantle is made by using artificial silk, instead of ordinary cotton. But this simple statement does not convey the importance of the change without explanation. Artificial silk was first discovered by Chardonnet several years ago, and is now a large article of commerce—being used in enormous quantities for mixing with silk for textile fabrics. It seems strange, but it is nevertheless a fact, that artificial silk is not employed as an adulterant of silk, but for the purpose of giving it an extra brilliance, gloss, and colour for evening wear. It is made in two or three different ways. One is to take ordinary cotton, and convert it into soluble gun cotton by using the well-known process of nitration. The gun cotton is then dissolved in a mixture of ether and alcohol, forming collodion. This collodion, after being thoroughly purified and filtered, is driven at an enormous pressure through a capillary hole in a piece of glass. The capillary hole is so called because it is so fine that a human hair will only just pass through it. When the collodion is driven through the capillary hole, the ether immediately evaporates, and the thread solidifies. About twenty of these capillary fibres are made at the same time, and form one thread, which is reeled upon bobbins. The thread so formed is then denitrated by passing it into a solution of sulphide of ammonia. After repeated washing in distilled water, the thread (which, chemically speaking, now consists of pure hydrated cellulose) is ready for sale as artificial silk. Another process by which artificial silk is made is by dissolving the cotton or any cellulose fibre in a solution of copper in ammonia, commonly called the Schwitzer solution. This solution being effected, it is driven through capillary tubes in exactly the same way as in the first-mentioned process. No denitration is necessary. The cellulose is then washed in water, which removes the solvent, and constitutes, again, artificial silk. The third important process is that discovered by Messrs. Cross and Bevan—the well-known viscose method. The fibre so formed is different from a natural cellulose fibre in that it is solid instead of being tubular, and also different in that it is a hydrated cellulose, instead of the practically anhydrous cellulose which constitutes natural fibre. Now this hydrated cellulose is a colloid—a fact which is of great importance in the process to be described.

For the making of the Plaissetty mantle, artificial silk produced by one of the processes above mentioned may be steeped in a concentrated solution of the nitrates of thorium and cerium. The colloidal nature of the artificial silk causes it to absorb almost any quantity of this solution; and it appears to act in a totally different way from the ordinary cotton. It enters into actual

combination with the salts, as can be seen by examining sections under a microscope. The quantity of salt which it is caused to absorb to produce most regular mantles is about its own weight. It is then carefully dried; and, when thoroughly dry, is dipped in a highly concentrated solution of ammonia gas, with the result that the nitrates are converted into hydrated oxides, which remain in effective combination with the colloidal cellulose. It is a curious fact that, although, by this process, the fibre now contains something like 40 per cent. of its weight of oxides, it does not appear changed in any way. It has the same lustre, and is apparently the same size, only it is considerably heavier. Inspected under a microscope, it is seen to be perfectly homogeneous in structure, which distinguishes it entirely from the impregnated cotton fabric. The fibre when burnt leaves a skeleton of anhydrous oxides, but in a totally different condition from what is given when the nitrate is decomposed by heat.

The accompanying photographs distinctly show what is meant; and the following experiment will demonstrate the point: Take a little hydrated oxide of thorium, and put it in a platinum crucible. On burning, it will be seen that it immediately shrinks, and that, when it has been made red hot, the residue is very small and extremely hard. On the other hand, if a little nitrate of thorium is treated in the same way, it will be found that, after it is burnt, instead of shrinking, it greatly expands. The result is a residue approximately ten times the bulk of the original nitrates; and, instead of being hard, it is soft and pulverulent. The hardness is the secret of the Plaissetty mantle.

Another process by which the mantle is manufactured is as follows: The Schwitzer solution above mentioned is incorporated in a fine mill with hydrated oxide of thorium and cerium. Again, the colloidal action is apparent. The hydrated oxides are, as is well known, insoluble and opaque; but, when mixed with the Schwitzer solution and the hydrated cellulose, they seem to enter into combination with it, with the result that a clear fluid is



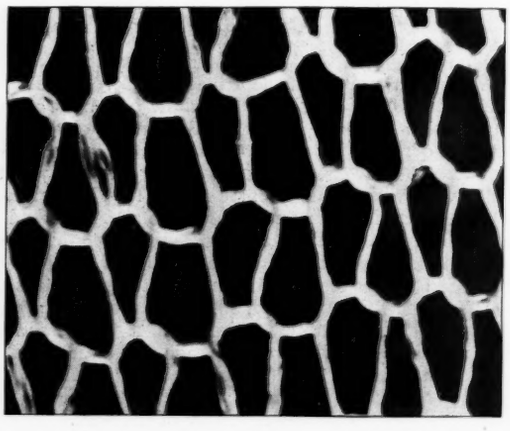
Fabric of a Welsbach Mantle Enlarged Sixteen Diameters.

obtained—highly opalescent, but capable of being driven through a capillary tube. The mantles of the Plaissetty Syndicate are made by both processes; and the result is practically the same. The fibre of the mantle is very thin, and absolutely solid; while the fibre of the mantle made by the ordinary process is comparatively coarse, and is pulverulent and soft. If a Plaissetty mantle is crushed between the fingers, it is reduced to a condition somewhat like sand; while an ordinary mantle resembles to the touch French chalk.

This, then, is the artificial silk in which are incorporated the oxides of thorium and cerium before the material is knitted and converted into the mantle of the well-known form. Each fibre of this is tough and solid; and to this solidity, and the comparatively small amount of organic matter it contains, are attributable the durability and the continuous high light-emission of the mantle in comparison with mantles made with a cotton base, which, when burnt off, gives to the filaments a tubular form. The prepared artificial silk is made in Belgium, where plant has been specially constructed for its production. The reasons that it is not manufactured direct in England are chiefly climatic—it requires a drier atmosphere than that of this country, and in addition water of a suitable character, both of which essentials obtain in Belgium. The material has an astonishing tendency to absorb moisture, and when it does this, it becomes so troublesome that it cannot be properly dealt with by the machines. In consequence, in its transmission from Belgium to this country, it is packed for protection in waterproof sheets; and then, on its arrival here, to ensure that it is relieved of every trace of moisture, it is treated in a hot-water jacketed oven. Immediately on its removal from the oven, it is dipped in a bath of benzene and paraffin, which solution gives it a water-proof coating, and obviates any further difficulty.

Now we have the skeins of silk ready for the processes through which it has to be put in the making up and finishing of the mantles. Here we see a reversal of one of the most important parts of mantle-making as hitherto practised. In the ordinary forms of mantle, the knitting is all done before it reaches the hands of the maker, and impregnation in the light-giving fluid is the first step. But in the production of the Plaissetty mantle, as we have endeavoured to make clear, the light-giving oxides form a large part of the mantle thread itself, and that thread is delivered to the mantle maker for knitting. Then, to witness the development of the mantle, we must first go to the knitting-room. There the girls take the skeins of prepared artificial silk, and place them on a spinning-machine, which winds the silk on to parallel spools in one continuous thread. In this operation, the extreme fineness of the thread is seen. Another point that is remarked is that the bobbins are fitted loosely on their spindles; and, if a knot or tangle occurs in the thread, the bobbin is stopped by mere frictional contact, and will not continue to run until the attendant has relieved the trouble. This machine is capable of dealing with the thread required for some 14,000 or 15,000 mantles a day. But it may be mentioned here that the plant so far installed in the Plaissetty factory is designed for an output of 5000 mantles a day. Of course, parts of the plant—this spinning-machine for example—are capable of a much larger production. This and the other machinery about the factory is driven by a $3\frac{1}{2}$-horse power electrical motor.

After the winding of the silk on to the parallel spools, it is transferred to conical shaped bobbins, for use on the knitting-machines. The knitting is a very interesting part of the process of manufacture. The active little machines give the girls little trouble; regulation (necessitated by occasional slight variations in the thickness of the silk) and supplying fresh bobbins being practically all the attention required of them. The machines can go on knitting the silk up in long lengths without cessation—making at predetermined intervals in the lengths, according



Filaments of a Plaissetty Mantle, Enlarged Sixteen Diameters.

to the class of mantle being knitted, a change to a closer stitch for the formation of the head of the mantle, and again dropping into the looser stitch for the body of the next mantle. The coarseness or fineness of the mesh of the mantle body depends entirely upon the type of burner on which the mantles are going to be used; and this can be varied by either tightening or loosening the stitch. At the time of our inspection of the manufacturing processes, the mantles that were being knitted were destined for the "C" class of burner. At this stage, each mantle section measured $7\frac{3}{4}$ inches long by $2\frac{1}{2}$ inches wide; and it was noticed that the girls frequently test the accurate working of the machines by gauging the knitted material by templates. There are ten of these machines already fitted; and they are each capable of an output of about 1200 mantles a day. Speaking of accuracy, it may be mentioned that one of the ruling principles throughout the establishment is that absolute regularity from the first process to the last is the only means by which uniformity in ultimate results, and consequently confidence in the duty to be obtained from the mantle, are to be achieved; and care is taken that this principle is observed. Before leaving the knitting-machines, a curious effect of the silk was pointed out, which illustrates its great tenacity and strength. In passing from the conical bobbin, the silk is led through an eye in a long bar over the top of the machine. This eye was formerly the source of difficulty. Although made of chilled steel iron, the threads quickly cut channels in the eye, and the slightest knot coming in contact with the cut caused the former to break. The only remedy for this mischievous effect of the silk has been the insertion of a perforated ruby in the eye.

Now we come to what may be termed the intermediate processes in the preparation of the mantles. It is noticed that, as the lengths of fabric leave the knitting-machines, it possesses a springiness, and one wonders how, in the subsequent processes,

it will be brought to a tractable state. The point is soon solved in the next department. There a girl is seen winding the knitted material on to deeply grooved reels; the groove being of definite width. She stretches the material by hand, so that it lies accurately and flat between the two sides; and then the filled reels are put into closed vessels where the material is steamed. It emanates from these nearly dry; and it is then seen that the tissue has attained a silky lustre, and no longer possesses the tendency to springiness and curling that was previously remarked. The long strips are next cut into mantle lengths by hand; but machines are in course of preparation that will do the cutting with considerably more speed, and a number at a time. The heads of the mantles are then fixed in an ether solution; the reason that an ether solution is used being that the mantles, having been coated with benzene and paraffin, a water solution would not have any effect. One girl is capable of fixing easily about 15,000 mantles a day. After fixing, the mantles are hung in glass cases to dry; but for this purpose, too, a machine is being developed. In the next stage, the heads of the mantles are finished off—this operation being performed by girls working in sets of sixes.

In these intermediate stages, the work is very similar to that usual in other mantle manufactories; but, when we come to the burning and seasoning part of the operation, an ingenious development—based on scientific principles, and by which the work is done with great exactitude—is found. It is an electrically driven machine (one of the Syndicate's own productions), which will burn and season ten mantles in one operation, and requires of the operatives but the minimum of attention. The working portion of the machine (of which, by the way, there are several fitted) is enclosed in a large case, with an ample ventilating-hood above,

Microphotographed Plaissetty Filaments—Magnified to 36 Diameters.

and a protecting frame of green glass in front of the operative's eyes. The parts of the machine in which readers will be specially interested are the ten bunsen burners, and the moving frame on which the mantles hang. The bunsen burners are fixtures, are of considerable length, have mushroom-shaped heads, and are lighted by ten pilot-jets on a swinging arm. The chief interest in connection with the burner is the fact that the burning and seasoning are accomplished in one operation, by means which must be left for future explanation. The moveable mantle-bearing frame has been carefully adjusted to secure the perfectly central suspension of the mantles over the burners. By the movement of a weight, the girl (after lighting the burners) brings the heads of the mantles down close to the tops of the burners; and then, on the machine being set in motion, the frame is slowly lifted, and the mantles are gradually and regularly burned off and seasoned throughout—slightly shrinking in length and circumference, and getting whiter and whiter as the operation proceeds. The mantles, under this system of operation, attain a uniform stiffness, which ensures an equal shrinkage in the toughening. The gas supplied to these machines is raised to 10 inches pressure by means of a Keith compressor; and the representatives of the Syndicate speak very highly of the efficiency and economy of the Keith apparatus for the purpose. There is a little point here, in connection with the use of this high-pressure gas, that will particularly interest gas engineers. The high-pressure gas in rushing through the gas-inlet of the burner formerly had a wearing effect on the inlet; and frequent readjustment was required. The explanation given is that the gas contains minute particles of sulphide of iron and oxide of iron, which cut as a sand-blast on the inlet. Several devices were tried to overcome the trouble; and success has at length been attained, but at present we are prohibited from going into details. Of course, in a burner so carefully adjusted as these are, the gas-inlet governs the constancy of the mixture; and dependence on its constancy and ultimate calorific value could not be secured while the slow but gradual enlargement of the gas-inlet was proceeding.

The burning off and seasoning of the mantle brings us to one or two facts which the investigation of the process of manufacture disclosed, and which go to prove the moderate amount of destructible organic matter that the prepared artificial silk contains as we first saw it. On the mantle leaving the knitting-machine, the length of each mantle section was, as previously stated, $7\frac{3}{4}$ inches, while, after leaving the burning and seasoning machine, it had only shrunk to about half its original length. In the case of an ordinary made mantle, after being burned and seasoned, it is only between one-third and one-fourth of its original length; and this is due to the larger amount of organic substance in the base of the mantle. Another proof is found in the weights of the mantles before and after the burning and seasoning operation. In the case of one of the Plaissetty mantles taken indiscriminately from a number, after the fixing and finishing of the head of the mantle, it weighed, before the burning and seasoning, 2·2 grammes; while afterwards it weighed 0·772 gramme. In the case of a finished mantle of another make, the weight was found to be only 0·4 gramme. This superiority in weight of the Plaissetty mantle is due entirely to the fact that it contains a larger quantity of oxides than the other form, owing to the method of manufacturing the artificial silk, which is really the soul of this system of mantle production. This large proportion of oxides, and the solid character of the filaments, maintain in subsequent use the

Microphotographed Welsbach Fabric—Magnified to 36 Diameters.

shapely form which we found ran regularly through hundreds of finished mantles exposed to inspection before their final boxing.

After the burning and seasoning, the galleries which support the mantles during the process are sent up a lift to the collodionizing-room, where they are placed on a machine which, in causing the supporting frame to slowly rise and fall, immerses the mantles in the toughening fluid. The mantles are then dried in fan-ventilated cases, and afterwards suspended on frames for atmospheric seasoning. Subsequently, they are trimmed by a hand machine with a rotary motion; and this gives a perfectly level base to the mantle.

Now we come to the final test of the capability of the mantle; and this, in view of Professor Lewes's statement as to the value of mantles made under this system in respect of the maintenence of light-giving power, will be of especial interest. One of the mantles tested on a 10-candle pentane photometer, with a consumption of 4·2 cubic feet of gas at ordinary pressure, gave on the first reading 68 candles as the illuminating value with a "C" burner, and after burning a quarter of an hour a second reading gave a return of 78 candles. Then a mantle which had been burning continuously (day and night) since Oct. 15 (eight to nine days) was tested; and the illuminating power was precisely the same—viz., 78 candles. Inquiry as to tests for durability elicited the statement that mantles had been in use continuously for 1600 hours, and that one had never been known to drop in less time, excepting through accident. All of this speaks highly for the new mantle, in watching the fortunes of which, as being really something new in the mantle line for this country, we shall be highly interested. As further testimony, last Thursday a contract for 6 million mantles a year for Australia was secured.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1159.)

THE Stock Exchange continues to suffer from atrophy, and last week business was perhaps even more slack than in the preceding one. We must go back for many years to find a parallel to this long persistent state of inaction; and, indeed, some members of many years' experience say it is unprecedented in degree. Last week, of course, had additional disturbances to business caused by Jewish holidays and the closing of the Exchange on Saturday. Things were fairly steady at the opening, but soon began to droop; and all the rest of the week they were very dull. In the Money Market there was an abundant supply for short loans; but rates for discount were inclined to harden. Business in the Gas Market was not quite so bad as in other departments, and was certainly more active than it was the previous week, although operations were to a great extent restricted to the issues of the largest undertaking. Changes in quotation were few, and were inconsiderable in degree; but they indicated a good general tendency in favour of higher prices. In Gaslight and Coke issues, the ordinary was very steadily dealt in, and at exactly the same close figures which had been the limit of range during the preceding week—viz., 89-90¼. But within this limit, the last marks were the easiest of the week. The secured issues were well supported, and the maximum and the preference were advanced a point each. South Metropolitan was rather quiet and very steady at about 123 to 123½. A couple of transactions in Commercial, one of them at top price, were all the business marked in that line. The Suburban and Provincial group was almost unheeded. There was an advance of half-a-point in British; but the only transaction recorded scarcely seemed to warrant it. In the local Exchanges, Sheffield "C" receded a point; but Newcastle advanced half-a-point. In the Newcastle Exchange, this stock is quoted 104½-105½, and the public know what business can be done at. But in the London Stock Exchange, which persists in remaining open to the reproach of unreasonably wide prices, it is quoted 102-105, which brings the medium price a full point below the local minimum. Among the Continental Companies, business was very quiet; but the tendency appeared to be in favour of firmness. The only change was a rise in Imperial debenture. None of the undertakings in the remoter world moved except Ottoman, which had an advance. Business in the Water Companies was very slack, and not one quotation was changed. There is little inclination to deal while so much uncertainty exists as to what may befall the Government Bill, the abandonment of which is looked for in some quarters.

The daily operations were so uniform that they may be briefly summed up. On Monday, Gaslight maximum and preference rose 1 each, and British and Ottoman ½ each. There was no further change until Thursday, when Imperial Continental debenture advanced 1. Friday was unchanged; and on Saturday the House was closed.

LOCAL ADMINISTRATION AND TAXATION.

READERS of the "JOURNAL" are aware that a large portion of the annual reports of the Local Government Board is devoted to the above subjects, as for the past year or two we have extracted therefrom statistics which have appeared to be of special interest to them. The thirty-first of the series, for the year 1901-2, has lately been published; and one section—that relating to the Metropolitan Water Supply—has been already dealt with. We now purpose reproducing from some of the others a few particulars bearing upon local administration and taxation. By way of preface, it may be mentioned that the report, which bears the signature of the Right Hon. Walter H. Long, extends to 204 pages —12 less than its immediate predecessor; and that it is followed by seventeen appendices, occupying 671 pages, or 51 pages less than before. As usual, the various subjects are arranged in five groups: The work of County Councils under the Local Government Act, 1888; proceedings under the Local Government Act, 1894; the relief of the poor; the public health and local administration; and local taxation and valuation.

Following the plan adopted in previous years, we will take financial matters first. The report records that the Board sanctioned last year the borrowing of £13,291,828 by urban and rural authorities, compared with £10,829,747 and £10,026,336 in the two preceding years. The former authorities required £741,845 for water supply and £1,862,042 for sewerage and sewage disposal, and the latter £217,591 and £377,562 respectively; while joint boards needed £77,632 and £36,300 for carrying out works for these purposes. The last item but one—the £77,632—is a significant one, as it furnishes very striking proof of the extended powers acquired by these boards in regard to water supply. In four years at the commencement of the past decade, nothing was needed for this purpose; while in 1900 the amount asked for was only £1108. From 1890 till 1901, a total of £190,771 was borrowed, of which a large portion figures in the accounts for the last-named year. Since the constitution of the Local Government Board in 1871, they have sanctioned the raising altogether of £126,282,892; and during this period £123,727,746 has been granted by Parliament. Detailed information with regard to all the loans authorized by the Board during the past year—their purposes, the authorities by whom they were to be raised, and the number of years allowed for their repayment—is furnished in tabular form in one of the appendices. Birmingham figures for £288,756 and Leeds for £161,400 for their gas undertakings; while Liverpool, Leeds, and Plymouth stand for £146,000, £100,000, and £90,657 respectively. Nottingham obtained £310,476 for carrying out sewage disposal works. For purposes of electric lighting, urban authorities were empowered to raise £3,995,459 last year. Under section 243 of the Public Health Act, 1875, the Board recommended the Public Works Loan Commissioners to make advances amounting to £225,115 to local authorities. Of this total, £212,050 was required by town and urban district councils, £11,428 by rural district councils, and £1637 by joint boards. In this connection it is pointed out that, under the Public Works Loans Act, 1898, the Board's recommendation is no longer necessary in the case of loans under the Public Health Acts, unless the period allowed for repayment exceeds thirty years.

The Board issued last year 46 Provisional Orders under the Public Health Act, and one under the Gas and Water Works Facilities Acts, 1870 and 1873. By some of these Orders, additional powers were conferred on local authorities in respect of their gas and water undertakings, including the purchase and use of additional lands for the manufacture and storage of gas, the supply of gas and of apparatus, &c., used in its consumption for lighting, heating, or other purposes, the alteration of provisions as to the appointment of a gas committee by a corporation, the supply of water in bulk beyond the limits of a local authority, and other matters. Many of the Orders conferred additional borrowing powers. For example, the Buxton Urban District Council were authorized to raise £26,000 for their gas undertaking; the Neath Town Council being granted £20,000, the Lytham District Council £10,000, and the Ripon and Torquay Town Councils "such sums as may be necessary" for a like purpose. The Buxton Council were also granted £15,000 for their water undertaking; Newark getting £20,000, and Newton-in-Makerfield £25,000 for theirs. Many of our readers are doubtless aware that, by section 62 of the Public Health Act, a district council may, under certain circumstances, apply to the Board to determine the reasonable cost at which water may be required to be furnished to houses without a proper supply; and the Board are empowered, by section 8 of the Public Health (Water) Act, 1878, to draw up a general scale of charges for the whole or any part of the council's district. Seven such scales were fixed last year, the towns concerned being Tewkesbury and a number of contributory places to Chorley, Hemsworth, Leigh, Lexden and Winstree, Preston, and St. Germans. In the Halifax and Sowerby Bridge Order, the Sowerby Bridge District Council were empowered to sell, and the Corporation of Halifax to purchase, the portion of the Council's gas undertaking within the borough; and the gas limits were altered accordingly.

Apart from the local inquiries conducted by the Engineering Inspectors of the Board with respect to applications made under the Local Government Acts of 1888 and 1894 and the Municipal Corporations Act, 1882, others were directed in 1075 cases. Of this total, 40 related to the issue of Provisional Orders under the Public Health Act, the Gas and Water Works Facilities Act, 1870, and the Housing of the Working Classes Acts, and 13 to applications for the consent of the Board to the institution of proceedings against manufacturers for the pollution of rivers. Among the subjects of the other inquiries were complaints as to the default of district councils in the performance of their duty in the matter of water supply and sewerage, and objections to the construction by local authorities of works of sewerage or water supply beyond the limits of their districts. The approval of the Board in regard to matters within their jurisdiction was given, under section 4 of the Borough Funds Act, 1872, to the resolutions of 68 corporations and urban district councils to promote 62 Local Bills in Parliament, and of 57 to oppose 54 similar Bills. During the year the Board made reports to Parliament on 139 Private Bills, of which 66 were promoted by local authorities and 73 by companies or other bodies. In 16 cases the Board found it necessary to submit supplementary reports, in consequence of alterations made in the Bills during their passing through Parliament. Appended to the report is a list of the Acts obtained last year by local authorities and by gas and water companies in England and Wales, exclusive of the Metropolis.

In the twelve months covered by the report, the accounts of 818 urban councils and their officers were checked by the District Auditors of the Board, as were also those of 672 rural councils, 86 joint boards, and 227 joint committees appointed wholly or in part by district councils. There were five disallowances and surcharges in the cases of two of the three town councils whose accounts were audited; 499 in those of urban councils and their officers; seven in those of gas and water boards; and 298 in those of rural councils and their officials. Out of the total number of appeals made against allowances, disallowances, and surcharges, in respect of urban district councils, the Board decided 206, as well as three relating to expenditure charged in the accounts of two of the town councils already referred to, and one from an officer of a water board. They likewise pronounced judgment upon appeals relating to 80 disallowances, &c., in the case of the accounts of rural district councils and their officers. Particulars

of these appeals, and of the Board's decisions thereon, are given in an appendix.

We now come to the section of the report which deals with local taxation and valuation. It sets forth that the Board prepared and presented to Parliament in the past year returns showing the receipts, expenditure, and outstanding loans of the various local authorities in England and Wales for the financial year 1899-1900. They include summaries of the accounts of about 28,700 local authorities, compared with 29,500 for the preceding year. An epitome of the statistics given in one of the appendices shows that the aggregate receipts, excluding loans, amounted to £77,202,175; including loans (£23,438,816), to £100,640,991. The total comprised £6,035,526 from gas-rentals, &c., £3,730,219 from water-rates, &c., and £910,329 from the supply of electricity, compared with £5,407,329, £3,480,035, and £599,621 in the previous year. The aggregate expenditure, inclusive of a sum of £24,872,032 defrayed out of loans, amounted to £100,862,280. Of this sum, £15,698,721, or 15·6 per cent., was devoted to the repayment of borrowed moneys and the payment of interest thereon. Other large items of expenditure were £5,720,702 for water-works, £5,608,952 for gas-works, £3,515,232 for electric lighting, and £3,748,376 for sewerage and sewage disposal. The outstanding loans of the local authorities amounted at the close of the financial year under consideration to £293,864,224, of which sum £104,226,050, or 35·5 per cent., had been borrowed for the purposes of undertakings which are now, or may be in the future, reproductive—such as gas and water works, electric lighting plant, tramways, &c. The outstanding loans on gas-works at the above-named date were £19,819,301; on water-works, £53,404,347; and on electric light undertakings, £7,853,061, of which amounts £804,032, £3,833,054, and £2,708,360 were raised during the year.

The table showing how the amounts received from the public rates by the various classes of local authorities have risen since 1874-5 is one of the most interesting in the book. In that year, the total was £19,198,579; in 1899-1900, it was £40,734,219, *plus* £1,330,622 furnished by grants under the Agricultural Rates Act; making together £42,064,841, or an increase of £22,866,262. In last year's report the very considerable rise recorded was attributed to the "needs of an increased population," though, curiously enough, the statistics presented showed that the growth of the population had been very much less than that of the rates. This year the explanation is given that much of the increase shown is due to the "legislation which took effect immediately before or during the period comprised in the table." Certainly one item which has assumed significant proportions in the period in question is that resulting from the operation of the Elementary Education Act. Mr. Long cannot refrain from again (the matter was referred to in his previous report) directing special attention to it as being "particularly noticeable." The amount raised for the purposes of primary education in 1874-5 was £373,859; in the year 1899-1900, it was £5,275,548. We will leave this item to the thoughtful consideration of our readers, and the report to the attentive study of those who are desirous of obtaining fuller information on the many subjects dealt with therein than we have been able to afford in the space at our disposal.

WATER ACTS FOR 1902.

The following Acts of Parliament dealing with water supply were passed this year.

The Bournemouth Gas and Water (Poole Gas Transfer) Act contains the provision as to water, that the Company, upon commencing to supply water from the Wimborne pumping station to consumers within the borough of Bournemouth, give notice to the Corporation, who are thereafter to have two years in which to decide whether they shall require the water to be softened. Such decision must not be made until the expiry of twelve months, and the Company are to have eighteen months to do the necessary work for reducing the hardness of the water to 10° of Clarke's scale. In such event, a new scale of rental for domestic supplies is to come into force, as prescribed.

The Bristol Water-Works Act authorizes the construction of additional works for improving the distribution and supply. Certain sections of the Act of 1862 are incorporated for the protection of the Bristol Gas Company. Additional lands are to be acquired within three years; and the works are to be executed within seven years. The capital is to be increased by £280,000 of 5 per cent. stock, with one-fourth loan. Certain differential rates chargeable in the City are abolished. Water for trade purposes is chargeable at the rate of 2s. per 1000 gallons, under specified conditions.

The Consett Water-Works Act sanctions the construction of a new reservoir, called the Beldon Reservoir, situate in the parishes of Hexham (High Quarter Township) and Allendale, in Northumberland, to be formed by impounding the water of the Beldon Burn. A pumping station at Hunstanworth and certain pipe lines are also sanctioned. A tramway may be constructed. Compensation water at the rate of 1000 gallons per minute for a period in each year equal in the aggregate to 156 days of 24 hours is to be discharged down the impounded watercourse. These times are to be selected by millowners. The works are to be completed within ten years. Lands are to be taken and held for the protection of the source of supply. Various interests are protected by clauses. The Company may charge what they think fit for the supply of baths containing more than 50 gallons, and be paid quarterly in advance.

The East Worcestershire Water Act extends the limits o supply by the Company to include the parishes of Feckenham, Worcestershire, and Ipsley, Studley, and Lambourn, Warwickshire. The supply in this additional area is to be made effective within five years. A piece of land may be acquired for the construction of a water-tower. A reservoir is to be constructed in the parish of Bromsgrove. All the works are to be completed within five years. Additional 7 per cent. capital to the amount of £20,000 is to be raised, with one-fourth loan. Certain services may be required to be metered. Agreements with the rural district Councils of Alcester and Feckenham are scheduled and made binding.

The Grand Junction Water-Works Act authorizes the creation and issue of debenture stock to the amount of £100,000, subject to the usual conditions applying to London Water Companies' additional capital issues. The money is required for the extension of mains and services. The Act is not to enhance the value of the undertaking in the event of compulsory purchase within four years.

The Kent Water-Works Act empowers the Company to raise £150,000 in the form of debenture stock under similar conditions to the foregoing. The money is required for main-laying and enlarging the pumping-stations. The limits of the Company are extended to include the portion of the parish of Tatsfield north of the Pilgrim's Road. The private water-works on the Westerham Hill Estate may be purchased by the Company.

The Limpsfield and Oxted Water Act authorizes the construction of additional works, including a service reservoir in the parish of Limpsfield and a pumping-station at Tatsfield, in Surrey. These works are to be completed within five years. Additional lands are to be acquired, subject to the provision that no well is to be made within four miles of the Croydon Corporation pumping-station at Addington. The limits of supply are enlarged to include the parish of Cowden. The Company may raise £40,000 of new 7 per cent. capital, with one-fourth loan.

The Newcastle and Gateshead Water-Works Act empowers the Company to construct numerous works, including a new Catcleugh reservoir, in the rural district of Bellingham, for impounding the waters of the River Rede. This reservoir is to be in substitution for the Catcleugh reservoir authorized by the Act of 1894. Fresh arrangements are made in respect to compensation; and subsequently to the filling of the new reservoir, the discharge of the River Rede is to be 3,014,000 gallons daily in a continuous flow. The reservoir is to be completed within three years, and the other works within ten years. The new mains in the city of Newcastle are to be laid at a clear depth of 4 feet. A clause is inserted for the protection of the Gas Company. The existing preference stocks of the Company are to be converted into a uniform 5 per cent. preference stock. Additional 7 per cent. capital is sanctioned, to the amount of £480,000, with one-third loan.

The North Warwickshire Water Act extends the limits of supply to include the parishes of Church Lawford and Long Lawford. The time allowed by the Act of 1900 for the completion of certain works is prolonged. The terms upon which the Corporation of Coventry are to purchase the undertaking under the Act of 1898 are better defined. A well is to be made in the parish of Hampton-in-Arden. The law as to constant supply under pressure is abrogated in certain specified instances. Householders residing at a higher level than 280 feet above Ordnance datum must provide themselves with cisterns.

The Weardale Water Act empowers the Weardale and Shildon District Water-Works Company to acquire the undertaking of the neighbouring Consett Water-Works Company. From and after the passing of the Act, the name of the Company became "The Weardale and Consett Water Company." Additional water-works are sanctioned, including a reservoir for impounding the waters of the Burnhope Burn, and another on the Wascrow or Waskerley Beck. Compensation water is to be discharged in each case, under detailed conditions. The new lands are to be acquired within five years, and the works constructed within ten years. The existing share capital of the Company is converted into stock. The agreement for the purchase of the Consett undertaking is scheduled; and stock is created for issuing to the Consett proprietors, to the amount of £175,000. Additional capital to the amount of £840,000 is sanctioned, to bear a 7 per cent. dividend, with one-fourth loan.

The West Gloucestershire Water Act extends the limits of supply by the Company to include several parishes in the districts of Chipping Sodbury and Tetbury, at the same rates as in the older parts of the district. Additional capital amounting to £60,000 is to be raised, with one-fourth loan.

The West Hampshire Water Act extends the limits of supply to include those defined in the Barton Act, 1899. Additional capital is to be raised to the amount of £50,000, of which £3000 is to be issued as fully paid in exchange for the Barton undertaking. The loan capital is in the proportion of one-fourth. Water is to be laid on constantly under pressure. Supplies may be metered, the price being from 2s. to 1s. 6d. per 1000 gallons. All inns are to pay a rate of 9 per cent. on rental. The Barton

shares are not to take more than 1¼ per cent. dividend until the other ordinary shares receive 5 per cent.

The Wrexham Water-Works Act authorizes the construction of additional works, including a storage reservoir for collecting the waters of the Pentrebychan Brook, to be completed within ten years. Additional capital is sanctioned, to the amount of £48,000, with one-third loan. The preference shares and preference stock of the Company are consolidated into a general preference stock of £66,333, bearing a uniform 4½ per cent. dividend. The name of the Company is changed, to the "Wrexham and East Denbighshire Water Company."

The Ticehurst Water Act incorporates a Company with a share capital of £18,000, and power to borrow £6000 for the purpose of supplying the district named, in Sussex. The source of supply is to be a well and pumping-station in the parish of Ticehurst, and two other wells at Etchingham. The works are to be completed, and the supply made effective, within three years. Rates for domestic supplies range from 10 to 6 per cent. A scheduled agreement provides for the acquisition of some private water-works at Salehurst.

The Whitstable Water and Improvement Act authorizes the transfer, within two years, of the undertaking of the Whitstable Water Company, Limited, to the District Council, at a price to be agreed upon or determined by arbitration; and sanctions the borrowing of the money required for this purpose, to be repaid in 45 years.

The Ystradfellte Water Act empowers the Neath Rural District Council to obtain a supply of water from the River Tringarth, in the parish of Ystradfellte, Brecknockshire, and to acquire the Cwm Avon water undertaking. The authorized works are to be completed within ten years. Compensation water is to be discharged at the rate of 1,678,500 gallons per day in a regular and continuous flow, subject to inspection by the Board of Trade. Provision is made for the supply of the Neath Corporation at the price of 6d. per 1000 gallons. The same applies to the Briton Ferry District Council. Much of the Act is concerned with the protection of local interests. The sum of £162,300 is required for water-works purposes, to be repaid in sixty years. The rate for domestic supplies is 7½ per cent. The purchase of the Cwm Avon undertaking is by agreement with Wright, Butler, and Co., Limited.

OBITUARY.

Miss WOODWARD, who, as sister of Mr. William Woodward, of Bromley, was known to many of our readers, died on the 18th inst., after a week's illness.

The death is announced of Mr. JAMES STOKOE, who was until recently Chairman of the Sunderland Gas Company, of which he was a Director for 49 years. He also occupied the position of Chairman of the Board of the Sunderland and South Shields Water Company.

PERSONAL.

Mr. LOUIS PENNY, M.Inst.C.E., has been elected a Director of the Bombay Gas Company, Limited, in the place of the late Mr. Charles Gandon.

His Majesty the King held an investiture at Buckingham Palace on Friday, at the close of which a number of gentlemen whose names had been previously published were presented, and had the honour of knighthood conferred upon them by His Majesty in the customary manner. Among them were Sir GEORGE LIVESEY, Sir RALPH LITTLER, Sir OLIVER LODGE, Sir JOHN M'DOUGALL, and Sir A. W. RÜCKER.

We regret to learn, from a paragraph which appeared in Saturday's "Daily Mail," that Dr. Carl Auer von Welsbach is lying dangerously ill at his country seat in Styria.

Consequent on the appointment of Mr. John Foster to Birmingham, the Leigh Town Council have decided, at an extraordinary meeting, to separate the position of Electrical Engineer from that of Gas and Water Engineer. The Council appointed Mr. D. M. Kinghorn to the former post, at a salary of £156 a year, and resolved to secure a Gas and Water Engineer, at a salary of £300 per annum, rising to £450.

A brief account of a new apparatus to render air respirable in a closed space is described in the "Bulletin" of the French Physical Society. It was devised by M. Desgrez, in collaboration with M. Balthazard, and the underlying principle of its construction is the decomposition by water of sodium peroxide, with liberation of oxygen, absorption of carbon dioxide, and destruction of the toxic products of respiration. The apparatus consists of a distributor which, by the action of clockwork, drops the peroxide into water at regular intervals; a cubical steel box containing the water; and a ventilating fan. A refrigerator is also supplied, as a rule, to counteract the heating effects of the chemical reactions. An apparatus has been constructed, capable of enabling a man to work for at least three-quarters of an hour in a closed space, and weighing in all about 12 kilos.

NOTES.

Making Retorts Gas-Tight.

Herr Rudolf Kuhn, of Bruck, has been granted a United States patent for a process for rendering the interior of retorts, coke-ovens, &c., gas-tight. It consists in making a mixture of metallic dust and fine-ground ashes, or other impalpable material, preferably incombustible, and then blowing it into the closed retort or oven. The dust will float about for a considerable time, and will eventually settle in the pores or cracks, should there be any, and fill them.

Phosphates in Natural Waters.

The significance of the presence of phosphates in natural waters has lately been dealt with by Mr. A. G. Woodman, in the "Journal of the American Chemical Society." As the result of the examination of a large number of waters, the author states that there can be no question that the presence of phosphates in water in any appreciable quantity is an indication of pollution. It was found that the amount of phosphate and its variation seemed to follow the same general line as in the case of other mineral constituents which either accompany the polluting material or are produced by its decay. The amount of phosphates is, however, not so delicate an indicator as that of the nitrates and chlorides. The limit of 0·5 part of phosphorus pentoxide per million parts given by Hehner for unpolluted waters appears to the author to be rather low. He considers a safer amount would be 1 part, though the average would doubtless be rather less.

The Improvement of Cast-Iron Pipes.

At the recent meeting of the American Society of Municipa Improvements, a report of the Committee on Water Supply was presented and read by Mr. G. H. Benzenberg, of Milwaukee. In the concluding portion it was pointed out that while the attention of Water-Works Associations had been directed to the preparation of standard specifications for cast-iron pipe, no steps had been taken to improve its character. The Committee expressed the opinion that some modification of these specifications, particularly in regard to the method of cleaning the pipe and the character of the coating to be applied, might prove of advantage; and an investigation of this phase of the subject was suggested for the consideration of their successors. They also thought the time had come when a much smoother interior surface of the pipe, possibly secured by vitrified coating, should be required—thereby improving the efficiency of the pipe system, as well as ensuring its permanent protection; and they suggested this as a subject worthy of the investigation of the new Committee.

Solders for Tin, Cast Iron, and Copper.

In the "Chronique Industrielle," M. D'Arlatan gives the following method of soldering tin and cast iron: Clean the iron carefully, so as to remove all traces of oxidation, saturate it with spirit of salt containing a little zinc, heat the iron until the tin will melt by contact, and then solder to the tin in the usual way. For soldering copper, he recommended as follows: Take a solution of chloride of zinc and moisten the parts to be soldered, after they have been well cleaned; then bring them together, and place them in their final position. Heat up with the blowpipe, and let the solution evaporate. Bring the tin near, and when sufficiently hot it will melt, and run between the surfaces, which it will solder perfectly. A thin layer of lead amalgam should be placed between the surfaces, and an ordinary soldering-iron passed rapidly along the joint. The heat disengages the mercury from the amalgam, and the lead melts and solders the two surfaces. A cement made as follows is given as a cold solder for iron. Six parts each of sulphur and white lead to one part of borax. Dilute in concentrated sulphuric acid, and apply; press the parts well together, and allow the joint to rest for five to seven days.

Physics of Punching.

M. Codron has devoted much study to the physics of various mechanical operations, including that of punching holes in metals. He defines punching as a modification of shearing, in which the fibres of the metal are divided nearly at right angles to the movement of the tool; while the action is affected by the confinement of the severed material in the hole made by the operation. True shearing takes place up to a certain depth of penetration of the punch, after which the remainder of the metal breaks away, and the plug is forced out of the hole with a rapid decrease of the resistance to the tool. Experiments with a hydraulic punch show these successive actions, which are attended by other complications operating on the sheet of metal, including bending, compression, and flow of material. The resistance of a metal to punching may or may not be as much as its tensile strength. With some metals it is only 0·6 this strength. Some interesting experiments were made with punches of different forms. Punches with oblique cutting edges were shown to possess no advantage; the amount of resistance being the same, while the character of the work was not improved by the modification. Punches with

multiple cutting edges were found less satisfactory than the common form. In the case of iron and steel, the ductility of the metal along the line of punched holes is diminished by from 10 to 20 per cent., according to the nature of the metal.

A Report on Beaumont Oil.

Mr. Robert T. Hill, of Washington, has reported to the American Institute of Mining Engineers on the Beaumont (Texas) oil field and its congeners in the same State. It is stated that while the phenomena of the Beaumont field have occupied public attention, many are not aware that there are several other oil fields in the State of Texas entirely distinct from it, which may some day be profitably worked. There are also several localities where bitumen occurs as asphaltum. Beaumont, however, appears to be the only one on or near the coast. Its history as an oil field is interesting geologically, because the finding of petroleum in commercial quantities at this spot was no chance "strike," but was the reward of systematic research and exploration by Captain A. F. Lucas, whose first boring in 1900 only showed a trace of oil at a depth of 575 feet, when the casing broke, and the enterprise had to be abandoned. A second drill hole close to the old one was carried to a depth of 1100 feet through clay and quicksand, and became, in January, 1901, the famous "Lucas gusher." The oil that came from this source was found to be of a different quality from all other known petroleums, having a heavy base of asphaltum and being thoroughly impregnated with sulphur. The latter condition is not to be wondered at, seeing that the region offered as much promise of sulphur as of oil. The sulphurous nature of the oil was so apparent that on occasions (as March 4, 1902) it filled the atmosphere, leaving a coating of sulphur on many of the houses in Beaumont, some three miles away. This impurity was thought to be inimical to the usefulness of the oil, even for fuel purposes; but Mr. Hill has testified that a year of experiment has shown the oil to possess many excellent qualities. After refining for the kerosenes, the remainder is "as good a fuel and gas-making material as can be desired." The flash-point of the crude oil is 120° Fahr., which is unsafe, or at least undesirable for shipment in bulk; but the defect can be obviated by a profitable preliminary refining, whereby the naphtha and kerosene are extracted. The flash-point of the gas oil left is 145° to 150° Fahr.

Municipal Corporations and the Water Gas Regulations Bill.—At the autumn general meeting of the Association of Municipal Corporations, held at the Hôtel Metropole last Wednesday (Sir Albert Rollit, M.P., presiding), the *agenda* contained a notice of a proposal by Mr. G. C. Kent, the Town Clerk of Longton, to call attention to the Water Gas Regulations Bill that has been introduced in the House of Lords by the Earl of Dudley. When the item was reached, Mr. Kent said it was not his intention to detain the meeting by going into details on the subject. He brought the question forward at the Dublin meeting some time ago, and then urged that legislation should take place in regard to it. A Bill had now been presented; but his desire was that it should be examined by the Association, and any necessary amendments in the interests of Corporations should be secured. He therefore moved that the subject should be referred to the Council, in order to secure any desirable amendment. Alderman Miles, of Bolton, seconded the motion, which, without discussion, was unanimously carried.

Natural Gas in America.—In view of the prominence which has lately been given to the operations which are going on at Heathfield, in Sussex, for obtaining natural gas on a sufficiently large scale to allow of its supply commercially, special interest attaches to a report recently issued by the United States Geological Survey, furnishing statistics showing the extent to which this gas is employed in America. It is generally acknowledged that much of the great growth in manufactures in the States during the past twenty years has been due to the use of this gas, which is generally sold at the low rate of 15c. per 1000 cubic feet. When it is mentioned that the value of the gas sold last year was $27,067,500, it will be seen that the consumption must have been something like 180,450 million cubic feet. If the 20,000 cubic feet of natural gas which are taken as the equivalent of a ton of coal may be assumed to be correct, this bulk of gas displaces or adds to the production of heat units as much as would come from 8,458,600 tons of solid fuel. The value of the gas for 1901 exceeded that of 1900 by $3,368,826, and that of 1899 by $6,992,627. It is estimated that, considering the displacement of coal and wood effected by natural gas, this product, as a whole, represents nearly half of the entire value of the various petroleum products of the country. Not only has the consumption increased, but the number of wells was also slightly greater at the end of 1901 than in the preceding year. During the year, 800 miles of pipe were laid down; bringing up to 21,848 miles the total length of mains in use. As showing the extent of the employment of natural gas in industry, the report says it is in use in 5742 establishments, 102 of which work in iron and steel and 219 in glass. In addition, it is estimated that fully a million domestic fires are supplied by natural gas, and that four million people are furnished in this way with fuel and light.

COMMUNICATED ARTICLE.

GAS MATTERS IN THE UNITED STATES.

THE PROPOSED CHANGES IN THE "CONSOLIDATED" PLANT.

Some months ago, I wrote to you of a wild tale about the purchase of the East River gas tunnel by the Long Island Railroad, and its intended enlargement; also about an asserted plan to remove all the works on Manhattan Island and erect one plant, in place of the half-dozen at present in operation at Matt Haven, on the mainland. I inferred at the time that somehow and somewhere another intention was concealed in this tale. I still believe so; and although many people seem to think that the "murder was out" when the tale of the enlargement of the Consolidated's Long Island plant was published, there are objections to this theory. Anyway, the tale is current that such enlargement is to be made. It is said that new pipes are to be laid in the tunnel, of such size as to convey from across the river as much gas, and may be more, and that the distribution system on the Manhattan side will be modified accordingly.

Naturally, at first sight, the construction of the new plant seems the great deed; but it is a trifle compared to the other problems. To increase the plant is simply to build new units—to duplicate buildings and constructions now in existence. But it is another problem to lay out the new system; and even to those who know Mr. Bradley's capacity for work, this seems no trifling task. Of course, much of the real labour will fall on Mr. Smith, the Superintendent of Distribution; for to him must fall the laying out of the cross town lines to carry the gas from the place of manufacture to the sub-stations, which, it is said, will occupy some part of the ground now used by the manufacturing plants at various places. I am told that the plan formulated by these gentlemen is to retain the holders, and, were they to prove needful, to erect new ones at satisfactory points for distribution—keeping those which they now have, and erecting others of large capacity for storage; for the gigantic plan is said to include having more than twenty-four hours' supply ahead. One man in authority expressed himself thus: "We intend to have enough storage that, if anything happens, will give us grace to repair it; so that the public shall only hear of it as a might have been, not as a thing which is or was." It is said that Messrs. Bradley and Smith are intending to use wrought-iron, or rather steel, pipes instead of cast-iron ones, and to pump the gas at high pressures from the works to the distribution tanks. As the exact course they intend to give these pipes is known only to Messrs. Bradley and Smith, all statements of distance and connections is simple guess work. But others know something of the "lie of the land;" and it is said the longest "pump line" will be about twelve miles.

One cannot but congratulate Mr. Bradley on having got thus far in a scheme he has long been working on; and it is not premature to congratulate him on the successful issue, for I feel sure that such will come as surely as he undertakes the work. It would seem that Mr. Smith's burden would be lightened; for when once the system is in working order, he will not be busied with the task of using a surplus in one district to make up for deficiencies in another. This seems to be no trifling task at times, owing to the changes in the amounts demanded by the different distribution areas; and his task has been made none the less heavy by the continual change in the demand areas. It is hard to get the gas into every part of a district in just the way needed when the amounts and conditions of demand change as they do in this city; so that a year will convert it almost into another problem from the one just patiently worked out. Pipes in the ground are data; and one cannot change them, even when one knows that they are insufficient for the problem in hand. Fortunately, this was, in a way, foreseen; and the changes are not so vital as they might be, although the variation at times gives cause for much hard thinking.

There is certainly one man in New York who will be glad of all this; and that is the Superintendent of Manufacture, Mr. G. Woods. He will have something to rejoice over, for most surely it is easier to handle one plant, however large, than a dozen plants, whose sum the one plant is, scattered over a territory of 226 square miles. Truly, considering with what means he has performed his task, he has done wonders. Without a map, it is hard to shadow forth even this enormous change. But to me, while it has for about five years seemed sure to come some day, it did not seem to be destined to come quite so soon; yet here it is. What a delightful thing it would be if some one could discover New York in the way in which Sir Walter Besant discovered London! The changes have been more rapid here; and yet the past is as deeply buried. Ten years ago, these blocks of buildings, upon which their builders and their contemporaries looked as we look on the new building on the "flat-iron," with its score-and-a-half or so of floors and more tenements than a good-sized town has business men, were torn down to provide room for a new building with ten times the available floor-space of those three which stood on its ground. Every room in this building will be rented, and must be provided both with gas and with

electric light. The electricity can be ground out in the building; but not so the gas.

Oil-burning Transport Ships—and the Outcome.

It must be admitted, I think, that the experiments with that Pacific mail steamer which was transformed from a coal burner to an oil burner has proved the usefulness of oil. The details of the report of the engineer who made the voyage to report on the defects and vagaries of the plant are not yet public property; but enough is known to make it certain that, taken "big and large," the experiment outdid success. If so, the change will not stop here. True, it is no doubt that for a time this will be the only change; but it will not belong to the mind of American engineers in the future, any more than it has in the past, to stop here. The use of oil to make steam and then use the steam in the ordinary engine is palpably absurd; the proper way will certainly become an accomplished fact now in short order. But we must see a better oil-engine than we have yet seen—we must have one which will do all steam does, and do it better; then we will no longer think even of oil-burning steamers. Yet this is the thin end of the wedge. Curiously enough, it is from the success of this experiment that a new departure in gas making promises to come. People are as yet not able to look with complete content upon explosion engines. The use of electricity as power in transit for long distances has had its day, with the means now in use, although improved means of transit might work a change at any time; but the employment of gas under boilers and for various uses has been a great success.

Working on these lines, some gentlemen interested in mines which yield up soft and gas coals have formulated this scheme. The preliminary meetings were held one day last week in the Empire building—at an office therein, to be more accurate; and although not much was given to the papers, judging from the reports, no trifle was done in fact. A report was read on the possibility of putting up a plant near some mines on the West Virginia field for making gas from the mine refuse, which is already quite too abundant, and then piping the power to manufacturing centres and to the seaboard. It is proposed to use as raw material for this gas, as I just said, the refuse coal and the pile of non-marketable coal which so quickly collects about the soft-coal pits. There was much discussion about the amount of gas which could be made from a given weight of this refuse; and this must needfully be in doubt until it has been tried on a larger scale than has yet been attempted. But all the samples of the coal which have yet been worked up, be they large or small, have yielded gas of just about the same quality and of just about the same composition, the same as the ordinary and typical run of cannel gas. It is said that the coal proved very uneconomical as fuel, and that, by using a part of the yield to make with, they had about 50 per cent. of the yield to sell.

I have no personal knowledge of these things; I am only repeating what I was told. This was the sum total of my information—that it was intended to begin the making of gas at the mine and to pipe it hither and yon as the case might be. You may wonder why I am telling you this under this heading; it is because the success of this oil-burning scheme gave the men who are behind this gas-making scheme the courage of conviction and the promise of success. How far they think that the gas can be advantageously pumped, and under what pressure, I do not know; but I am told that they took Mr. Shelton for the Moses, and one man said: "If he (Mr. Shelton) can pump his gas five miles in New Orleans, we can pump it 500 miles from here." If "here" was the point on the map where his pencil point touched, he had in mind a range with Chicago at one end and New York at the other. I heard that later on in the week the same gentlemen had a meeting in a building in Nassau Street, in which is the New York office of a firm not unknown in London, and, it may be, it was in their office. My information does not extend thus far. At this meeting, the question of bye-products and their values was discussed at length, and an effort was made to establish the fact that some very favourable features existed in the scheme looking towards the manufacture of gas for the sake of the residuals, and sending only such materials through the mains as they had no use for in chemistry and industrial arts—sending CO, CH_4, and H_2 through the mains, and converting everything else into products of at least industrial value.

Having on a number of occasions made experimental runs in a model working plant with this coal, one of the men who were consulted as expert engineers expressed the opinion that, since the only use of the gas was to burn under a mantle, and since the useful range of temperature was established by other manufactured product, there was no use in crowding up the temperature by means of products which manifestly were more valuable for other uses. So far as I know, this is the first time any practical man has gone so far as to voice what has for a long time been an article of faith in academic circles—that there was a choice to be made among the various possible sources of calorific energy in gas samples.

The True Meaning of this Chemist's Opinion.

Just as soon as I was able to make sure that this opinion had been expressed, I wrote a note asking what he really intended his words to signify, and what he really had said. In return, he sent me a copy of his report, "for my own information and instruction," and authorized me to do anything I liked with it, except publish any part verbatim or give his name. He afterwards, however, authorized me to give the following as his expert opinion. Since I cannot but consider it a bit remarkable, I have carefully abstracted the following, and have submitted it to him. In effect he says:

> Although the present opposition to the change in the character of illuminating gas has been made to seem as the work of the gas engineers of the oldest school, it really finds its influence in the interests represented by a firm which has offices in both New York and London. Their special product is a gas of high luminosity; and the mantle, instead of being a great aid to them, is in a way unwelcome, because it enables those to compete who under other conditions would be quite out of the running. Now I hold that a unit so high as that given by the Welsbach mantle, with 5 feet per hour, in a perfected burner, of the old style gas, is quite too high for practical and fully enjoyable use under most conditions. Therefore I anticipate during the next few years a great reduction of this unit. It now is in good fixtures with a perfectly adjusted burner burning 5 cubic feet between 80 and 100 standard candle power. This is too much—very much so. The most comfortable light to the majority of people, as shown by the record of 6482 persons which I have, gives 30-candle power as the choice. It thus becomes a question if 5 cubic feet with a quality "A" mantle is more than enough, which shall we do, cut the amount of gas down to $\frac{3}{10}$ths the present consumption and use a mantle of $\frac{3}{10}$ths the present size, or shall we make one $\frac{3}{5}$ths the present size, using $\frac{3}{5}$ths of the amount, employing a gas of less efficiency, and an inferior mantle? I am in favour of the second scheme. We can just as well as not have a mantle of the present size, burning 5 cubic feet of gas costing 5 c. per unit (100 cubic feet) per hour and giving 30 candle power with a mantle of the standard size costing 5 c. by the package—say, 8 c. apiece by the single one at retail. I know that these mantles are possible, and I also know that the gas is possible. You may draw your own deductions; but I do not see how they can be other than those I drew.

A letter such as this is no place for discussing his conclusion or his premisses, and yet it is impossible not to consider the why and wherefore of his statement. You will note he is disposed to take as granted that the high-power mantle will sell on its merits only, and that a less power mantle will sell beside it. You will also note that he seems to find his conviction strengthened by the needlessly high quality of the gas. Truly a proposition to cut down the resulting efficiency in the gas $\frac{3}{5}$ths will render it rather useless as an illuminant, unless the mantle is an artifice of universal employment. But these three ideas are now met on every street corner between this hotel and the battery: (*a*) That in a few years a light without a mantle will be almost as common as a tallow dip; (*b*) that the mantle used will be intended for a much smaller unit, but more of them than at present; (*c*) that the quality of the gas (meaning luminosity of the naked flame) will also be reduced; and (*d*) that, although the amount of gas burned will be somewhat reduced, may be this reduction will be by no means so important proportionally as the reduction in price.

My correspondent said: "I believe the chief cause of this reduction will be changes in the method of manufacture; the gas being then made under circumstances which will permit of a works system as much larger than that of the Consolidated as the Consolidated is larger than that of a country town. Yes, as much bigger than the 'Consolidated's new proposition.'" What think you of that idea? Surely this is a country of large ideas and of men who translate the largest of them into brick and stone and iron. It would not surprise me to see some one getting such an attempt under way; and if I am not mistaken, the very man who made this report at the meeting in the building in Nassau Street is the very man who is destiny guarded unto this hour.

Mr. Richmond's Death.

If the souls of the departed take any cognizance of earthly things, surely this man's soul must be gratified to know how much people valued him. Even here, one finds that men consider with regret how much has been lost to all gas interests by his unfortunate recall from his post. Yet those whom the Gods love always die young; and it may be that the Gods loved him well. The family must find a melancholy satisfaction in knowing that even in this country there are those who admired and esteemed him.

The fourth of the new volumes of the "Encyclopædia Britannica" which Messrs. A. & C. Black are issuing in conjunction with "The Times," contains articles on electricity and its supply, by Professors Fleming and Thomson, Dr. L. Duncan, Mr. W. C. D. Whetham, and Mr. E. Garcke; on gas and gas lighting, by Professor Vivian B. Lewes, F.I.C., F.C.S.; and on gaseous fuel, by Professor G. Lunge.

The Sulphate of Ammonia Committee, it may be remembered, offer special prizes for award in the malting barley competition held annually in connection with the Brewers' Exhibition at the Agricultural Hall, Islington. Samples of barley grown by the aid of sulphate of ammonia were sent to the exhibition which closed last Friday from Devonshire, Essex, Hertfordshire, Lancashire, Staffordshire, and Warwick; and the Committee's three prizes were awarded. The first (£25) was gained by Mr. A. W. Sturgeon, of Offley, Hitchin, Hertfordshire; the second (£15) by Mr. R. Seabrook, of Townhurst Dairy, Essex; and the third (£10) by Mr. Carl Adams, of Langdon Farm, Dawlish. The sample for which the first prize was awarded was grown on a loam soil with a chalk subsoil; the two immediately preceding crops having been roots and oats. Mr. Seabrook produced his sample from a mixed soil; and the barley followed mangold and wheat. The soil worked upon by Mr. Adams was red gravel, with sand as the subsoil; and the previous crops were clover and wheat.

TECHNICAL RECORD.

NEW GAS-PRODUCING PLANT AT OLDHAM.

Oldham's Mayor, Aldermen, Councillors, and chief municipal officials assembled at the Town Hall on Saturday in compliance with their acceptance of the invitation of the Chairman (Alderman G. Hanson) and members of the Gas Committee to inspect together the new retort-house (with its regenerative settings and power stoking machinery) at the Higginshaw station and the carburetted water-gas plant at the Hollinwood station. For the former plant, the occasion may be termed (although not so described) that of its inauguration; for, in the first place, it is only recently that the Contractors—the West Gas Improvement Company—completed the erection of the plant, and, in the second place, the event was celebrated by a dinner in the evening at the Town Hall. The Town Council numbering 48 (nearly all of whom were present), and being supplemented by the town officials and a few friends of the General Manager of the department (Mr. Arthur Andrew) and of the Engineer (Mr. Tim Duxbury), the inspecting party was a goodly one. Association and conversation with many of the local leaders during the afternoon gave the impression that a wonderful amount of amity and accord exist in the Council as between section and section and committee and committee on most matters affecting the commonweal. They are as practical in their ideas and views on public business matters as are the gas-works which they went to inspect the embodiment of those practical principles which move those of whose nature they are a part to scout elaboration, and plan and build with the one object of securing that the value to be derived from the works shall bear the best possible relation to the money expended. Of such are the town councillors of Oldham, their officials, and their works.

The arrangements for the events of Saturday were in the hands of Mr. Arthur Andrew; and everything that he could do (aided by Mr. Duxbury) to make the occasion one of both interest and instruction was done. The company were taken to the works by two special electric tramcars—the first visit being to the Higginshaw station. There the Engineer took charge of the visitors; and, in rendering information to the councillors, he was usefully helped by his assistant (Mr. J. E. Dudley), as well as by Mr. J. C. Belton (Chester), Mr. S. Glover (St. Helens), and Mr. J. S. Naylor (Manchester), and Mr. Fred and Mr. Ernest West, who represented the Contractors. A little account of the first function to engage attention on arriving at Higginshaw will come appropriately here as an introduction to the description of the new works. Assembling in the air-compressor house, the Mayor (Mr. J. E. Eckersley) called upon Alderman Hanson, as Chairman of the Gas Committee, to unveil a mural tablet, which will inform future generations of the year in which new conditions of coal-gas manufacture first began to supplant the old, and of the men who occupied the chief offices in connection with the gas-works at the time the change was made. His Worship remarked that, from what he knew of the Gas Committee, they were proud of their works; and he was also sure, if the inhabitants of the borough were to look over the works from time to time, they too would be greatly impressed by their importance. In complying with the Mayor's request, Alderman Hanson spoke of the deep interest which the occasion possessed both for himself and every member of the Committee, and also of the individual attention that each member gave to the work that had been entrusted to him.

The tablet, which is headed with the words "Borough of Oldham" and the coat of arms, records that "the first installation of regenerative settings and stoking machinery was completed on Oct. 25, 1902." It also bears the name of the Mayor; and the members of the Gas Committee: Alderman G. Hanson, Chairman; Alderman Prestwich, Vice-Chairman; and Messrs. J. Berry, J. Nadin, R. M. Sixsmith, J. Thompson, H. Wilde, and J. Wrigley. Following these are the names of Mr. A. Nicholson, Town Clerk; Mr. A. Andrew, General Manager; and, bracketed together, Mr. John Chadwick and Mr. T. Duxbury, as Engineers. There are two things particularly noticeable by gas men about this tablet. It describes the new installation of regenerative fittings as "the first," which suggests that it is the forerunner of the conversion, as opportunity arises, from the old order of direct firing and shovel charging to the new methods of working. Prior to the new house being equipped, the number of retorts on the direct-fired principle was 480, and the total productive capacity was 2,500,000 cubic feet of gas per twenty-four hours. The new house has, within 250,000 cubic feet, the same productive capacity, and yet it only contains 152 retorts, or 304 mouthpieces. When the Town Council appreciate this, and also the fact that the new settings effect a saving of 50 per cent. in fuel as compared with the old direct-fired settings, that the furnaces last longer, that without any increase in the item of labour they can accomplish so much more under the new condition of things—all of which mean economy—there will, the prediction may be safely ventured, be no hesitation on their part to sanction to the full the necessary expenditure on conversion when the Gas Committee, advised by their responsible official, tell them that the time has arrived when the alteration can be profitably and judiciously made. The second point about the tablet, which we noticed with especial pleasure, is the fact that the name of Mr. John Chadwick is linked with that of Mr. T. Duxbury as the Engineer; and in this way his connection with both the old and the new works will be preserved in memory. In the main, the new scheme was his (the only exception, we believe, being the coal-handling plant, which, too, would necessarily have formed a feature of the scheme had he lived to complete it). But it was left to his successor to see his plans consummated; and this work Mr. Duxbury has well and faithfully performed.

With these introductory notes, we will leave the visiting party, and give a general description of the extensions without following the course taken during the inspection. The new retort-house at Higginshaw makes that station the largest coal-gas producing establishment of the four works possessed by the Corporation. The capacity of the existing old retort-houses at the station has been mentioned. But, in connection with them, it may be mentioned as a point of interest that machinery for unloading and storing coal was installed in 1890 by Mr. Chadwick; and it is a testimony to the character of the work that it is now rendering as useful performance as it was twelve years ago. As now so then, the Contractors for the plant were the West Gas Improvement Company; and there is interest to be derived from an inspection of the old plant in conjunction with the new to see the advances in improvement that have been made during the years that have rolled by. Regarding the new extensions, as mentioned previously, they were designed by Mr. Chadwick, and comprise a retort-house, coal-store and plant, the regenerative settings, and the compressed-air stoking machinery.

The cross section and plan of the new buildings (pp. 1142 and 1143) will convey a good idea of their completeness, and of the character of the whole design, which gives an absolute independence to the house and a simple straightforwardness to the whole of the operations. The buildings are plainly but strongly constructed. The retort-house itself is 220 ft. long by 65 ft. wide, and 54 ft. high from the basement to the apex of the roof. The coal-store is of equal length, 60 ft. wide, and 38 ft. high to the apex of the roof. The boiler-house, which contains two Lancashire boilers, is 46 ft. by 30 ft.; and the air-compressor room, which adjoins, is of about equal dimensions. The erection of the buildings (which is the only part of the work that was not carried out by the West Gas Improvement Company) was commenced in 1899; but more than one cause has operated against the early completion of the scheme. In the first place, Mr. Chadwick's death unfortunately occurred in the midst of the work; and then it was found that no particular hurry was called for on account of the demand for gas. As a matter of fact, Oldham experienced a falling off for a period in the rate of increase—traceable to a descent in both manufacturing and ordinary lighting requirements. To a large extent, gas had been used in the district for gassing yarns for the market; but this demand has, we believe, almost, if not entirely, ceased. Then, combined with this, there was the very free adoption of incandescent gas lighting in Oldham and the area served; and this again helped to arrest progress. But the Gas Committee and their General Manager were not dismayed, as it was fully recognized that the little depression caused by the latter would mean an eventual improvement by the more extended adoption of the superior mode of gas lighting; and that the new channels that had been opened in which to develop consumption would bring about the equipose between the former and the then reduced demand, and give the necessary spur to the resumption of the old rates of increase. Their faith has been justified—the balance has been secured, and since March 25 last the further upward move has been proceeding in a very satisfactory manner; and the Committee have now their new house in order to meet the advancing demands. Thus it came about that the contract for the stoking and coal handling plant was only let this year; and last Saturday saw every part of it in full operation—a smart piece of work on the part of the contractors.

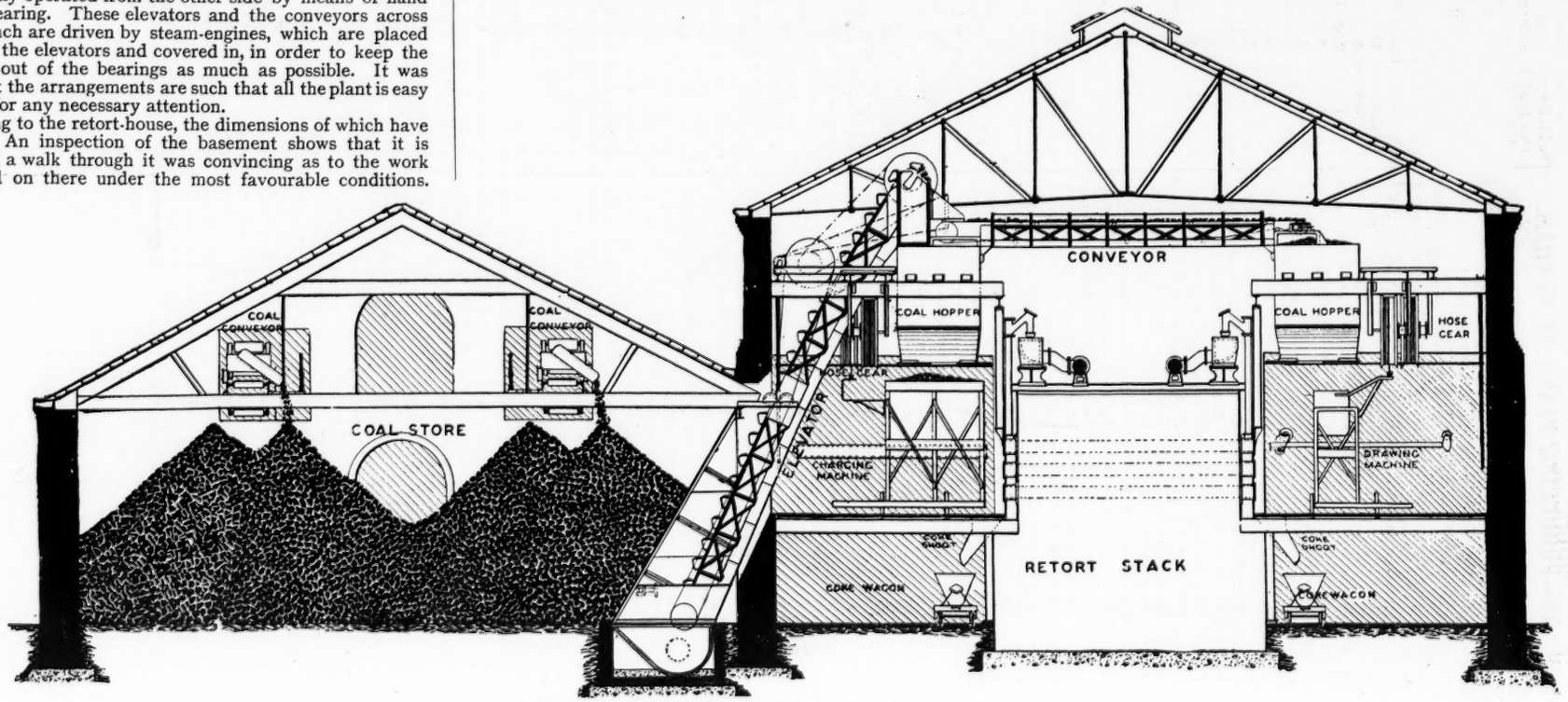
In giving a description, we cannot do better than start with the coal-handling plant. There are two complete sets of coal plant in every respect identical; and the plan of the extensions supplies a general idea of its character and position. As will be observed, the coal is brought from the sidings in waggons into the shed which shields the receiving hoppers, breakers, and elevators to the stores. The trucks (which are operated by a compressed-air hauling capstan, of which there are four about the works) are run over two capacious hoppers above the coal-breakers, and into these hoppers the coal is tipped—the operation being performed by powerful hoisting crabs, which are fixed above the waggons, and supported by strong cast-iron columns and steel girders. The crab merely consists of a small carriage fitted with winding drums and chains, and is capable of travelling on the girders overhead so that either end of a waggon may be lifted by the chain, which is fastened to the waggon-wheels. On opening the end of the waggon, the coal simply slides out into the hoppers. Before proceeding, it should be stated that each set of the coal plant is capable of dealing with from 40 to 45 tons an hour. Below the hoppers are powerful coal-breakers, and from the pits beneath, the coal is elevated by bucket elevators, which are of a strong and substantial type. The elevators deliver on to band conveyors running the full length of the coal-store; and from any part of the conveyors the coal can be tipped into the stores by means of a tipping carriage running along the conveyor. As is seen in the plan, the conveying plant is entirely independent, so that the

whole area of the coal-store can be covered with coal. Practically the plant is a duplicate of that erected in the old coal-store twelve years ago, to which allusion has already been made; the chief differences being the improvements in details and driving arrangements introduced as the result of the subsequent experience. On the two extreme sides of the basement of the coal-receiving shed are two National (type "V") gas-engines of 42-horse power; and, by the arrangement of the gearing, either engine is capable of working either set of the coal plant.

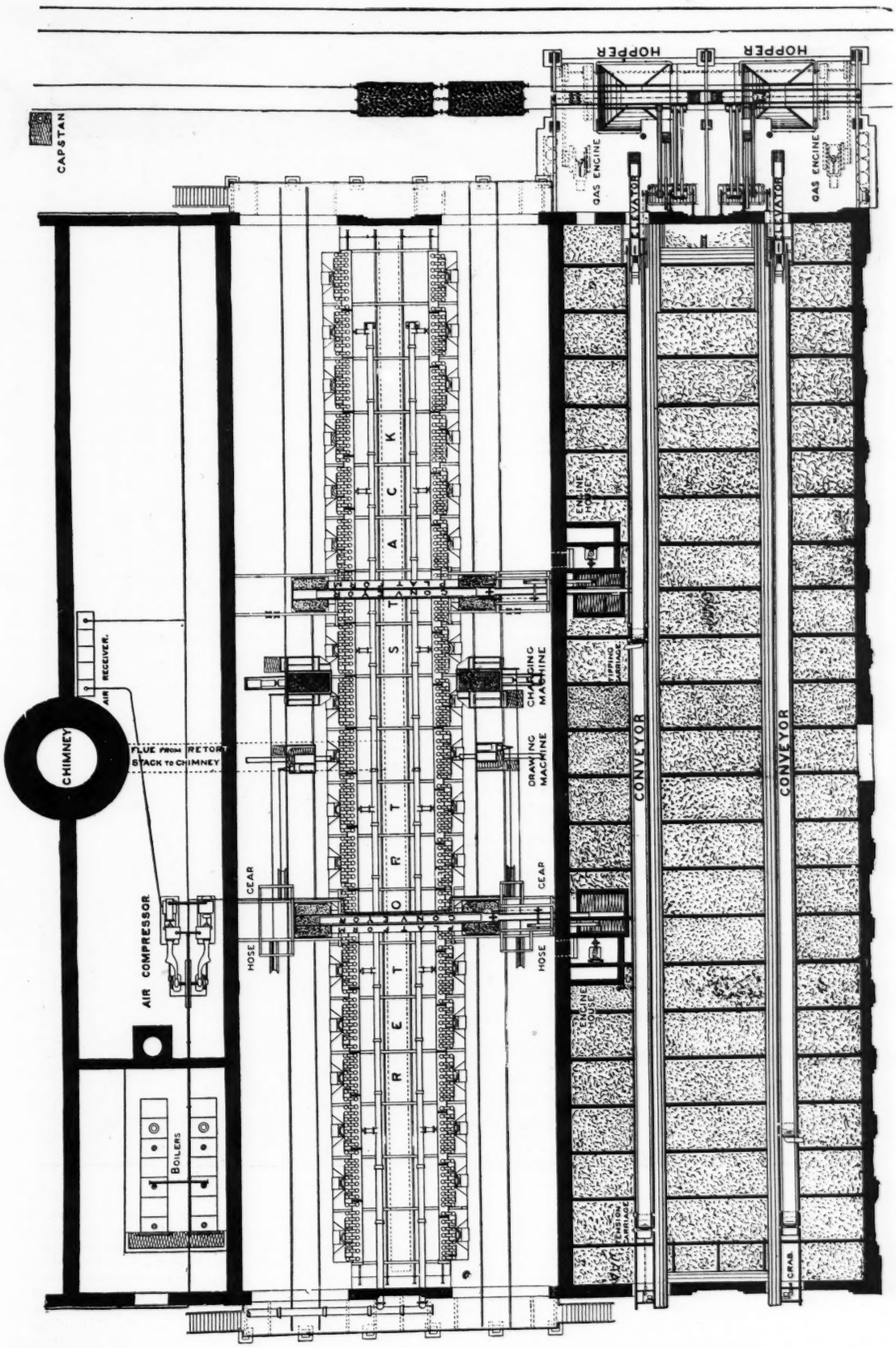
Passing into the store, it is seen that the coal is lifted into the retort-house by two elevators, each of a capacity of about 5 tons an hour. They deliver into two hoppers on the near side of the retort-bench, and, by means of transverse band conveyors, into two on the opposite side. These hoppers, which have a capacity of 10 tons each (together 40 tons) are fixed to girders supported in the walls at one end, and on the retort-bench at the other. In the coal-store, these latter elevators are protected by large steel shields, so that the coal can be heaped up against them, thus providing a large supply close at hand for delivery to the elevators (without trimming) through doors at the foot of the shields. The doors are easily operated from the other side by means of hand wheels and gearing. These elevators and the conveyors across the retort-bench are driven by steam-engines, which are placed at the foot of the elevators and covered in, in order to keep the dust and grit out of the bearings as much as possible. It was observed that the arrangements are such that all the plant is easy of approach for any necessary attention.

Now turning to the retort-house, the dimensions of which have been given. An inspection of the basement shows that it is spacious, and a walk through it was convincing as to the work being carried on there under the most favourable conditions. The stage-floors are reached by outside stairways at either end of the house; and here again we find that, both in width and height, careful regard was paid by the designer to the securing of sufficiency in every way—nothing is cramped, and the good height and the open ends above the stage-floor keep the house well ventilated. The bench consists of nineteen settings (11 feet centres) of eights, 20 feet through, and set in three tiers. The retorts are of ⌂ section, 22 in. by 16 in., and are capable of carbonizing about 30 cwt. of coal each per twenty-four hours. As already stated, the total productive capacity is approximately 2,250,000 cubic feet per day. The ascension-pipes are 6 inches internal diameter; and the hydraulic mains are made in sections. About the other fittings, there is nothing special to notice. A pair of West's compressed-air charging and drawing machines are installed on either side of the house; and their appurtenances are fitted after the manner so well known in connection with this type of machinery. The air-compressor is fixed in the building outside the retort-house to which we have already been introduced. The type of compressor is that described as the "double-line," in which there are two steam cylinders in tandem with the air cylinders. After the air has been compressed, it is stored in a cylindrical receiver, from which it is conveyed by iron pipes to the drums (in the retort-house) which carry the flexible hose by which the machines are fed. The one compressor serves the two sets of stoking machinery and the four capstans in the yard for hauling.

All this work, the purposes of the various parts of the new plant, and the improvement they effect upon the old conditions of working, were pointed out to the visitors on Saturday by Mr. Andrew, Mr. Duxbury, and their professional friends, and highly delighted the councillors appeared to be with their new property. They were taken to see one of the retort-houses working under the old direct-fire system. The men were charging with shovels, the place was littered with coal, and the furnaces were being fed with cold coke. The labour involved, and the difference in the time occupied, by charging retorts a shovelful at a time must have impressed the councillors when they compared it with the experience of a few minutes previously, when the Chairman of the Gas Committee, by simply pulling a lever, charged a retort quite after the manner of an experienced machineman. The new



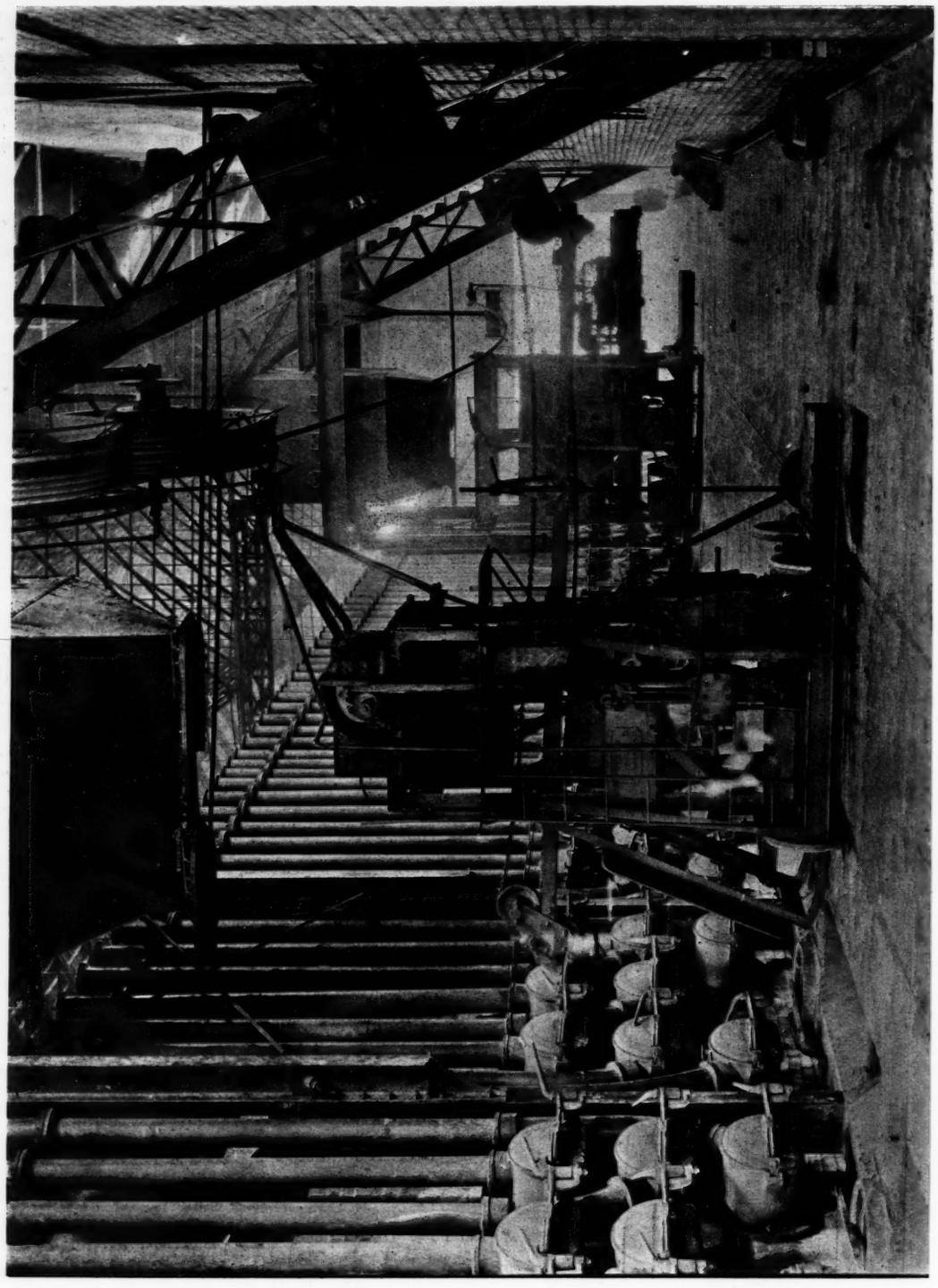
Cross Section of New Retort-House and Coal-Stores.



PLAN OF NEW RETORT-HOUSE, COAL-STORES, AND BOILER AND COMPRESSOR HOUSE.

works throughout bear testimony to the excellence of the designs of the Engineer, and of their capable interpretation and completion by Mr. Duxbury and the Contractors.

The inspection of the Higginshaw works ended, the company left, in the special electric cars, for the Hollinwood station to view the new carburetted water-gas plant, which was constructed by Messrs. Samuel Cutler and Sons. A full description of the plant (illustrated by a plan) appeared in the "JOURNAL" for Jan. 28 last—a week after the new work was formally brought into service. The productive capacity of the present two sets is a million cubic feet a day; but the buildings and auxiliary plant are designed for the addition of a third set of 500,000 cubic feet per day. When formerly describing this plant, we stated that the manner in which the Contractors "had executed the work had gained for them very high encomiums from those in authority in this busy Lancashire centre;" and after the experience of the working during the months that have elapsed, the same statement can with truth be re-applied. By the time the visitors had reached the works, dusk had set in, and they did not spend long over the inspection.



View of Retort-House, showing West's Compressed-Air Stoking Machinery.

Returning to the Town Hall. the party dined together. Subsequently, Alderman Harrop (the Chairman of the Electricity Committee), giving the toast of the "Gas Committee," said that he wished to expose two fallacies—one that the Gas Committee made large profits, and the other that there was rivalry between that Committee and the Electricity Committee. As to the profits, the Gas Committee only made about 3 per cent. on the capital invested, giving £9000 yearly to the relief of the rates and the street lighting, which cost something like £5000. He held that e'ectricity would become the lighting factor of the country, but even then gas had a great future. To realize "Beautiful Oldham," they would have to look to the Gas Committee. Why, he asked, should not the Gas Committee go in for a trade-gas main, as the Water Committee had provided a trade-water main, simply for the use of the commercial community? It was quite possible that smoky Oldham might then be entirely changed. Alderman Hanson, in responding, said that, during the past two years, the demand for gas had rather fallen off. The main factor in this reduction was probably the introduction of incandescent burners, and another reason was the slackness of the cotton trade. As to the extensions and improvements, which had cost about £40,000, the Committee believed that the money had been well spent. From Sept. 25 last, the price of gas had been reduced 2d. per 1000 cubic feet; and it was hoped that the year's working would amply justify the change. Alderman Prestwich gave the toast of "The Contractors." Mr. F. J. West responded; and he remarked that the late Engineer (Mr. Chadwick) and the Committee were to be congratulated on having introduced the improvements the Council had seen that day.

According to the Paris Correspondent of the "Ironmonger," the experiments in incandescent lighting by alcohol which have been made at their Dol Station by the Western Railway Company of France have proved so satisfactory that the system is to be employed at the stations at Lisons, Garches, and Clamart—the two latter being in the suburbs of Paris.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Fourth Annual General Meeting of this Association was held on Saturday last, in the Municipal School of Technology, Manchester. There was a good attendance of members. Mr. S. E. Halliwell (Littleborough) presided.

In the report presented by the Council, they expressed their pleasure in stating that the Association continued to prosper. During the year, the membership had increased from 49 to 57, notwithstanding the fact that eight names had been withdrawn in accordance with Rule 7. Visits had been made to the gas-works at Rochdale, Southport, Leigh, and Blackburn; and also to the Stockport Gas-Engine Works of Messrs. J. E. H. Andrew and Co. Papers had been read by Mr. Casmey (of the Keith and Blackman Company), on "Intensified Gas Lighting;" and by Mr. R. T. Stoddard, on the "Manufacture of Sulphate of Ammonia." The attendances of members at the meetings had been satisfactory, and no doubt those who had availed themselves of the opportunities afforded by the Council's arrangements had been greatly benefited. Respecting the recent discussion on the lack of facilities for the aid of the sons of the gas industry, the Council reported that they had introduced the matter to the Incorporated Gas Institute, the Institution of Gas Engineers, the Manchester and District Institution, and the North of England Gas Managers' Association, and expressed the hope that they might be able to report further progress in the near future. They had been assured that the matter would receive serious consideration by these bodies. The balance-sheet accompanying the report showed cash in hand amounting to £15 19s.

The Chairman, in moving the adoption of the report, said the members could congratulate themselves on having had a prosperous year. The visits to the various works had been instructive and pleasant; and the papers had proved to be of interest to the members. He appealed to them to give more help in this direction. The balance-sheet showed that financially they were in a healthy condition. They were glad to hear that a Junior Association had been formed in London, and they hoped it would receive every encouragement, as they were of opinion that such Associations should be established in all suitable centres. They would note with pleasure, in connection with the proposed amalgamation of the Incorporated Gas Institute and the Institution of Gas Engineers, that a clause had been inserted in the Memorandum of Association, setting forth that one of the objects was "to improve and elevate the technical and general knowledge of persons engaged in, or about to engage in, the profession of gas engineers or managers; and with a view thereto to provide for the delivery of lectures and the holding of classes, and to establish chemical and experimental laboratories or experimental works, and to test, by examination or otherwise, the competence of such persons, and to award prizes, certificates, and distinctions, and to institute and establish or accept trust funds for the purpose of scholarships, grants, rewards, prizes, and other benefactions." It was provided that every certificate of competence or distinction should contain a note to the effect that it was the result of an examination held on behalf of the Institution, and had no statutory effect. They trusted that this would be of great advantage to their own Association. He concluded by expressing the hope that the year they had entered upon would be a prosperous one.

Mr. R. T. Stoddard (Manchester) seconded the motion, and it was carried unanimously.

After two slight alterations had been made in the rules, the election of officers was proceeded with. Mr. S. E. Halliwell was elected President, with Mr. Hill as Vice-President, and Mr. Braddock as Treasurer. Messrs. R. H. Garlick, C. Berry, S. G. Barber, H. Smith, and W. Baxendale were chosen as members of the Council; and Messrs. Wareham and Stoddard as Auditors. Messrs. E. J. Wellens and F. Oldfield were re-elected Secretaries of the Association.

GLEANINGS FROM COKE-OVEN PRACTICE.

The following is an abstract translation of the paper on "Recovery Coke-Ovens" read by Herr Hilgenstock, of Dahlhausen, before the recent meeting of the German Association of Gas and Water Engineers. Brief particulars of the paper have already been given in the report of that meeting in the "Journal" (*ante* p. 146); but it is now officially published *in extenso* in the "Journal für Gasbeleuchtung."

The consideration of that branch of industry which concerns "coke-ovens equipped for the recovery of bye-products," and of its relations to the gas industry, covers two industrial departments, which are indeed allied, but have hitherto remained distinct. Only lately has here and there the feeble beginning of a coalescence been observable; and the author can only therefore at this juncture present a few aspects of the industries as they occur to him.

Starting from the time when the coke-oven works began to make the ovens as brickwork chambers having the character of gas-retorts—a change which was begun more than thirty but less than forty years ago—the author recalls seeing in his youth the old Schaumburg oven (in which carbonization was effected by the combustion of a portion of the coal) in operation in the Ruhr district. It was the Belgian, Evence Coppée, who introduced the oven which rendered it possible to make the fundamental departure from this method. His type of oven became, and has remained, the most prevalent, and only a trifling proportion of the 9½ million tons of coke which are made annually in the Ruhr coal district are produced in other varieties. At the author's works, it has always been the favourite. Briefly, the Coppée oven is a much elongated horizontal oven chamber, of which the side walls consist of vertical heating passages.

It has kept its foremost position in the coke industry since distillation or recovery coke-ovens were introduced over twenty years ago. By distillation coke-ovens are to be understood those in which the gases formed by the carbonization are led away from the chamber of the oven, in order that their valuable constituents may be abstracted before they are passed into the heating passages for the purpose of heating the chamber. The difficulties which presented themselves when recovery coke-ovens were first introduced were attributed to the loss of heat due to the cooling of the gases for the recovery of ammonia, tar, and light oils. But actually they arose from the defective mode of introducing the cooled gases into the system of heating passages, and of supplying the air required for combustion. It had not been observed and properly appreciated that hitherto much more gas had come into combustion at too late a stage in the heating passages, and that, consequently, much more heat had been lost, so far as heating the chambers was concerned, than could be lost by cooling the gases. The form of oven, however, which admits of the heat lost by the cooling of the gases being utilized for heating the chambers, by restoring it by means of regenerators to the air supplied for combustion, has given the most striking results. It is known as the "Otto-Hoffmann" oven, and need not be described in detail. The Coppée wall is divided into halves, united by a passage at top; and the heating takes place alternately from each side. This form of oven has been erected in thousands by the author's firm.

The extraordinary reliability of this oven, which depends on the constant recovery of heat from the effluent gases, has, however, not allowed fundamental defects of this method of heating to be properly realized. Such defects, however, there are with regenerative ovens. The greatest of them consists in the reversible heating, which results in a highly unfavourable and defective distribution of the heat produced. For instance, it must be considered that at one end of the 33 foot long wall of the oven, the combustion of gas, by means of air at 700° to 800° C. (1290° to 1470° Fahr.), produces heating gases at 1300° to 1400° C. (say, 2370° to 2550° Fahr.), and the wall approximately attains this temperature; while at the other end of the wall the heating gases or products of combustion must be brought down to 1000° C. (1830° Fahr.) if they are to be properly utilized. On reversing, the wall has first to be raised from 1000° to 1300° C., and the other end allowed to cool down to 1000° C. That is the principal defect of heating by regenerators connected with the oven.

The application of independent regenerators, somewhat of the Cowper stove pattern, standing at the side of the oven has been contemplated for over twenty years, with a view to avoiding the reversible system; but their cost has been prohibitive. In may, however, be observed forthwith that whatever arrangement may be used, quantities of gas, corresponding to the quantities of heat restored for the heating of the oven, will never become available; because the losses of heat in the enlarged distributing passages are much too great. A good coking coal might yield 75 per cent. of coke and 10,765 cubic feet of gas per ton of (dry) coal carbonized. The purified gas should have a calorific power of nearly 600 B.T.U. per cubic foot, which is equivalent to 2873 B.T.U. per pound of coal. Then the amount of heat per pound of coal carbonized would be distributed somewhat as follows:

(1) Sensible heat of the oven gas . .	429 B.T.U.	= about	15 per cent.
(2) In the coke	430 ,,	= ,,	15 ,, ,,
(3) Spent gases (at 1050°C.	1402 ,,	= ,,	50 ,, ,,
(4) Loss by radiation	612 ,,	= ,,	20 ,, ,,
Total	2873 ,,	= ,,	100 ,, ,,

This calculation assumes, with regard to moisture and combined water (12 + 5 per cent.), that carbonization consumes the gas evolved. If the amount of heat in the spent gases—viz., 1250 to 1450 B.T.U. per pound of coal—were applied to preheat the air supply up to about 250°C. (480° Fahr.), then about 900 B.T.U., or rather more than 30 per cent., would be regained in the heating of the oven, and a corresponding quantity of gas would be made available. These facts have been plainly stated as a set-off to the fabulous statements occasionally made as to the surplus gas with this or that new oven.

It is acknowledged, even at the present time, in the Rhenish Westphalian district, that the cheapest and most profitable way of utilizing the heat of the spent gases is to use them directly for raising steam. To convert this amount of heat into available gas has not proved worth doing up to now. This fact, in conjunction with the defects of regenerative heating, conduced almost seven years ago to an oven being designed, known as the underfired oven. This has far surpassed in the work it does all other ovens, including the Otto-Hoffmann. The annual production of coke

actually amounts with one of these ovens to 1750 metric tons, which is equivalent to over 1⅛ tons of coke per diem per 100 cubic feet of oven charged. This productive capacity has been attained by no other oven; and of the 1879 underfired ovens erected since 1895, not one has been destroyed through overheating, &c. In fact, this oven realizes most completely by its mode of heating the carbonizing conditions which have technically been shown to be the most efficient. The greatly elongated prism made by the charge of coal is enveloped by two heated prisms formed by the walls of the oven, which are kept as nearly as may be at a uniform temperature.

Until other carbonizing conditions are proved to be more efficient, this oven will not be surpassed, especially as the construction of its substructure fully ensures the recuperation of the heat of the spent gases. The dimensions of the chamber of the oven—viz., length 33 feet, height 6 to 6½ feet, and width not much over 20 inches—have been chosen for good reasons. The length is determined by the expulsion of the cake of coke. With some coking coals, the cake of coke can be expelled from an oven 40 feet in length, but with others from one only 26 feet. The height is limited by the requirement of uniform heating, and by the strength requisite in the oven walls; while the width of the chamber is limited on the one hand by the required size of the pieces of coke, but, on the other hand, is made as small as possible in order to facilitate the progress of carbonization.

The progress of carbonization through the charge presents many peculiarities which are not completely understood; but as the same occurrences must take place more or less in gas-retorts, it may be well to consider them more closely in this paper. It will be useful to depict the condition of the charge in the oven, looked at in cross section, during the progress of gasification. When a fresh charge of coal is brought into the hot chamber of the oven, there follows, as soon as the moisture has been evaporated, gasification of the coal in the layer in contact with the walls of the chamber. The resultant hydrocarbons, however, especially the constituents of tar, are condensed to tar by the still cool adjacent layer of coal. Thus there are a coking seam and a tarry mass which is heated on the outside, but on the inner side is kept cool by the absorption of heat through evaporation—that is to say, it is not heated above 100° C. The water vapour penetrates into the interior of the charge of coal, and condenses; so that it is possible to show, by samples of coal taken from the interior, that the moisture in the coal there increases by several units per cent. in the first few hours of carbonization. Even if dry coal is charged into the oven, that in the centre, after a time, becomes moist from the combined water expelled from the exterior layers. With a charge which requires about 30 hours' distillation, the moisture from the coal in the interior, amounting originally to 10 per cent., will only have disappeared after half the 30 hours have elapsed.

The simple fact here pointed out is most important for coke-works, as it is through it that it becomes possible to make coke. If the aforementioned coking seam—characterized by a thickness of 1⅛ to 1⅜ inches, and by being heated on the side adjacent to the walls by a source of heat at 1000° to 1300° C., and kept cool on its inner side by absorption of the heat of evaporation—did not exist, or was not formed, the temperature would penetrate, with gradual and uniform diminution, into the interior of the charge, and coking would be impossible. It is, indeed, well known that the evolution of gas from coal occurs at lower temperatures, and may be completed at from 300° to 500° C. (from 570° to 930° Fahr.) without coke being formed. This production of gas then advances so gradually that the tarry constituents do not form a partition wall or diaphragm. On the same account, the so-called "lean" coking coals, which, by virtue of their natural position, have already been partially gasified, require specially hot ovens in order to concentrate the production of the tarry bodies, and so further the formation of the seam. The increased production of gas then keeps the inner side of the seam cool. On the other hand, the rich or so-called "fat" coals do not require such hot oven-walls.

On considering the coking seam somewhat more closely, it will be seen that it forms the clearly recognizable dividing wall or diaphragm of thick tar between the raw and almost unaltered coal and the solid coke, from which, however, the gas has not yet been completely expelled. If this dividing wall or seam is subdivided into three parts—viz. (1) the inner layer, next the coal, (2) the middle layer, and (3) the outer layer, next the coke, as shown in fig. 1, and these layers are each investigated as to the course of distillation, remarkable differences will be revealed, as indicated in the annexed table, under Experiment A. The researches recorded in this table were carried out on the author's works with great skill by Herr Ad. Bauer and Dr. Blasberg.

Experiment A proved: (1) That the residual coke decreases towards the interior; (2) that the production of tar falls off almost to one-third on the exterior, and the light oils to less than a half; and (3) the remarkable and important fact that the liberation of nitrogen as ammonia only shows small differences, being greatest in the interior and slightly less on the exterior of the seam. It is a great pity, for it indicates that the evolution of ammonia proceeds for the most part during the subsequent liberation of gas from the portions of coke which have already become solid. Herein may be found a substantial reason for the limited conversion of the nitrogen into ammonia, and the frustration of all attempts to increase the conversion. The author, after many researches, has been forced to the conviction that there is no immediate prospect of increasing the amount of nitrogen which is converted into ammonia.

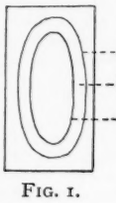


FIG. 1.

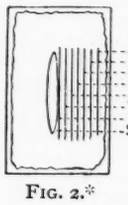


FIG. 2.*

On dealing with the coke portion of a not completely carbonized charge in the same manner—*i.e.*, dividing it into layers as shown in fig. 2, and making tests thereon, further striking results will be obtained. Such a series of tests is reported under the heading Experiment B in the annexed table. It will be seen from these results that (1) the quantities of gas evolved decrease rapidly but steadily towards the wall of the oven, and become *nil* in the finished coke; and (2) the tar, light oils, and ammonia decrease similarly.

If the progress of gasification as shown in the table is compared with the advance of the temperature towards the middle of

* Carbonization has advanced most fully at *a*; while there is still almost unchanged coal at *g*.

TABLE SHOWING PROGRESS OF GASIFICATION.

	Experiment (A). Layer or Seam of the Coal in Course of Distillation (see fig. 1).			Experiment (B). Layer or Seam of the Coal in Course of Distillation (see fig. 2).						
	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)
Yield of coke . . . . . percentage of the coal.	86·01	83·45	80·87	99·35	98·90	96·69	94·51	91·33	87·14	81·58
Cubic feet of gas per ton of coal*	9513	9279	9972	416	448	2124	4277	7873	9520	10,794
Do., inclusive of sulphuretted hydrogen, carbonic acid, and benzene*	9789	9566	10,280	452	510	2228	4417	8027	9792	11,124
Ammonia . . . . . per cent.	0·325	0·339	0·354	0·002	0·005	0·053	0·183	0·244	0·306	0·318
Volatile (free) ammonia, as sulphate . . . . . ,,	1·201	1·241	1·307	0·000	0·000	0·172	0·673	0·946	1·078	1·175
Non-volatile (fixed) ammonia, as sulphate . . . . ,,	0·062	0·075	0·066	0·010	0·022	0·035	0·040	0.062	0·110	0·057
Total sulphate of ammonia . . . . ,,	1·263	1·316	1·373	0·010	0·022	0·207	0·713	1·008	1·188	1·232
Total of volatile constituents . . . percentage of the coal.	13·99	16·55	19·13	0·65	1·10	3·31	5·49	8·67	12·86	18·42
Tar . . . . . ,, ,,	1·03	1·98	2·70	..	..	..	..	0·17	0·83	2·29
Gas liquor . . . . . ,, ,,	4·65	4·85	5·06	0 09	0·01	1·10	2·13	2·79	3·21	3·90
Carbonic acid . . . . . ,, ,,	1·12	0·97	0·99	0·20	0·34	0·58	0·77	0·75	1·10	0 91
Sulphuretted hydrogen . . . . ,, ,,	0·17	0·23	0 26	..	0·01	0·02	0·02	0·08	0·25	0·35
Benzene . . . . . ,, ,,	0·31	0·59	0·67	..	..	..	..	0·01	0·15	0·81
Total† . . . . ,, ,,	7·28	8·62	9·68	0·55	0·97	2·59	3·28	4·08	5·86	8·51
Gas (by difference) . . . . . ,, ,,	6·71	7·93	9·45	0·10	0·13	0·72	0·72	4·59	7·00	9·91
Moisture . . . . . ,, ,,	0·05	0·39	0·37	..	..	..	..	..	..	..
Nitrogen . . . . . percentage in the coal.	1·69	1·61	1·74	..	..	..	..	..	..	..
,, ... ,, ,, coke.	1·44	1·61	1·54	..	..	..	..	..	..	..

* Measured at 15° C. and 760 mm. The volume under these conditions is practically the same as at 60° Fahr. and 30 in. bar.

† There appears to be a want of concordance between the items under Experiment (B) and the totals, as shown in this line. The figures are correctly transcribed from the German original.—ED. J.G.L.

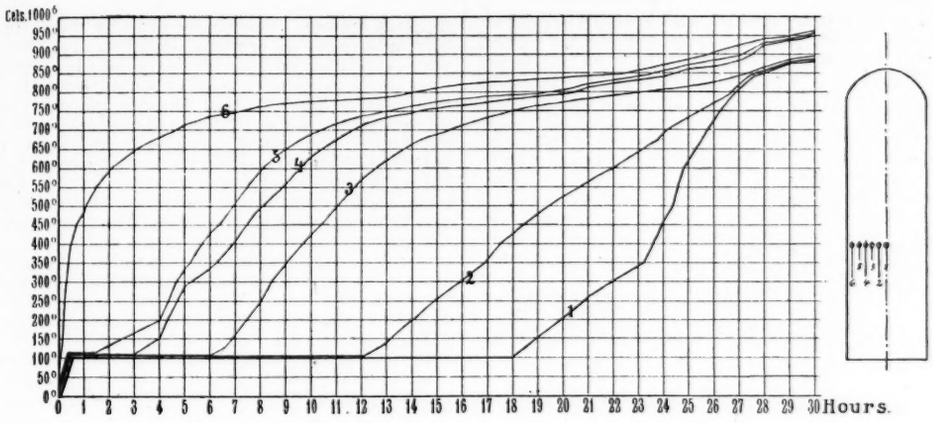


FIG. 3.—THE TEMPERATURES DISPLAYED IN THE SLAB OF COKE DURING THE TIME ALLOWED FOR CARBONIZATION.

the charge in the oven, as is done graphically in the annexed diagram (fig. 3), it will be seen that there is a tolerably broad zone between the beginning and end of the evolution of gas. In this zone, the gas evolved can rise up unaffected. The gas from the dividing wall or thereabouts is the richest in heavy hydrocarbons, while the rest of the gas, especially that evolved towards the close of gasification, is poorer in hydrocarbons, and consists almost solely of hydrogen.

As the raw coal in the charge comes to an end, the quantity of gas from the partition wall or thereabouts decreases; while the gas from the remaining parts of the gas-evolving zone will increase in quantity, but is inferior. This explains the fact that a charge yields worse gas as carbonization advances, and towards the end substantially hydrogen only. The layers of red-hot coke through which the gas passes have not so great a deteriorating action on it as is usually assumed. This action can be recognized through the detached pieces of coke being covered by a layer of pure graphitic carbon, as their appearance indicates, and as may be proved by comparing the percentage of ash on the surface of such pieces with that on their interior. This graphite may supplement the residual coke from the tar seam in acting as a cement or binding material in the formation of the coke; and this action would be greatest in the upper portions of the charge through which the whole of the gas must penetrate. In fact, it can easily be recognized that the deposition of graphite is greater in the upper than in the lower portions of the block of coke. This circumstance is one which is in favour of good quality in the coke; for it tends to bring up the quality of the upper portions of the charge, which are not so tightly packed, and are inclined to produce less dense coke than the rest.

One point in the diagram calls for comment. The curve which shows the temperatures found in the interior of the charge at no place discloses the temperature at a standstill or retrograding. This proves that the influence of a fresh charge in an adjoining oven has been, and is, over-estimated in ovens for the recovery of bye-products. With ordinary ovens, which depend for their heating on the gas which they evolve, the case is different. But for the rest, the same phenomena always occur in the transverse section of the charge in the chamber, even when the chamber is a gas-retort. Recovery coke-ovens, as already pointed out, have been developed so that now the charge in the chamber constitutes an elongated prism; and the walls of the chamber are hot prisms encompassing it. The prism of coal gets its supply of heat only from the sides, or in any case not at all from above.

This perfecting of the recovery coke-oven has made it possible for it to produce an average gas from poor gas coal which is scarcely inferior to the coal gas of many gas-works. For instance, the following are analyses of (1) the gas from a coke-oven plant at the author's works, and (2) coal gas from a municipal gas-works in the district.

	(1) Coke-Oven. Per Cent.		(2) Gas-Works. Per Cent.
Carbonic acid	1·4	..	1·70
Oxygen	—	..	0·60
Carbonic oxide	6·6	..	7·10
Heavy hydrocarbons	3·2	..	3·00
Methane	25·0	..	28·62
Hydrogen	56·4	..	52·75
Nitrogen	7·4	..	6·11

Recovery coke-ovens evidently should aim at the production of clean oven gas, while making good firm coke, as the purity of the gas is responsible for the yield of the bye-products: Tar, ammonia, and light oils. But as this ultimate aim has been attained by an elongated narrow and high oven-chamber, the charge in which is heated only from the sides, and certainly not from above, the gas-works retort, as shaped and maintained up to the present time, cannot ensure a proper production of gas. The author has no hesitation in asserting that a modern recovery coke-oven produces more cheaply from the same gas coal more and better gas per ton of coal than the gas-retort.

The competition of coal gas with other illuminants, which has hitherto been so successful, has naturally directed attention to a reduction in the cost of producing coal gas. It is clear that gas-works should endeavour to apply to their own case the results obtained at recovery coke-ovens. In what way they should proceed, is not yet finally settled. Recently a good deal of noise has been made over the supply of whole towns with illuminating gas from recovery coke-ovens in America; but actually only a very feeble start has been made. According to statistics, only about 33 out of some 1933 million cubic metres of gas consumed in North America is from coke-ovens. That forms but a trifling contribution towards the total gas consumed, and is only a small percentage—about 5 to 6—of the coke-oven gas made. In the author's estimation, the question not yet settled is: Are the gas-works to attach themselves to recovery coke-oven works, or are the latter to extend themselves into the gas-works?

The point can only be determined gradually. For instance, the coke-oven districts of Germany have both coke-ovens and gas-works in operation alongside one another. The coke-ovens could quite well and easily put at disposal over 28,000 million cubic feet of good illuminating gas from the 13 million tons of coal which they carbonize annually; and this could be done without much expense, and without affecting the work at the coke-ovens, for which 106,000 millions of cubic feet of gas would still be available. The quantity of gas which could thus be taken from the coke-ovens amounts to more than double the amount of coal gas consumed in Paris; and in the near future, though perhaps only very gradually, it will be applied in the industrial district of Germany for lighting and power purposes. The transformation of gas-works into recovery coke-works, on the other hand, is more easily conceived than accomplished. For instance, a town such as Düsseldorf, with a gas consumption of about 635 million cubic feet per annum, would have to erect in place of its retort-settings only about 100 oven-chambers in order to supply itself by means of the surplus gas if the daily demand were a regular one, and if the troublesome maximum requirements were not in the winter and the minimum in the summer. Consideration of the data will lead to the conviction that gas-works cannot develop into coke-works, as the latter are at present understood. We cannot get away from the fact that technically it has in general been found disadvantageous to make a large concern, which has to fulfil an independent purpose, dependent on some other concern.

The author has formulated the view for the immediate future that the available gas from the chambers of recovery coke-ovens will certainly be used to meet the lighting needs of the district. It will also be more and more used by other works for power and heating purposes. At the author's works, the more recent plant is equipped throughout with gas-engines driven by the oven gas. The author is so strongly of opinion that more and more gas from the recovery coke-ovens will thus find application in other directions, that he considers it out of the question that coke-works will ever become at the same time gas-works, as the latter term is now understood. If the coal gas industry wishes to accept the invigorating influences of the coke industry, which have lately been so stimulating it, it must (if the author may say so) take a middle course, other than its former way. It will be our task to smooth this course for it.

The author has intentionally spoken of what occurs within the charge in a recovery coke-oven. He must be excused for not dealing with the methods by which the bye-products are recovered, and the best arrangements for condensing and cooling the gas. He has also left the question of the recovery of cyanogen from coke-oven gases to those who believe that they have solved the problem successfully. He has tried to show, from what happens in the charge in a recovery coke-oven, that gas-works retorts and their mode of heating are not the most favourable. He has

pointed out that at the present time recovery coke-ovens produce a gas which, on the average, has the same composition as coal gas. He has indicated that the deterioration of the gas in the course of the process is determined not so much by the larger layer of incandescent coke, as by the bad residual gas from the coke. The gasification of coal in small quantities yields altogether different gas. The good gas is able to escape fairly unharmed within the zone of gasification in the charge of a coke-oven up to the last. Even towards the end of the process, the gas space is not heated above 600° C. (930° Fahr.). But in the charge in a gas-retort, the good gas—bad gas also is evolved—comes into contact with the hot walls of the retort, which are all around it, till it reaches the outlet. Decomposition of the tarry vapours, other hydrocarbons, and ammonia naturally ensues, and the whole of the gas attains the condition of that which can be produced from less good or less rich gas coal.

Consequently, it must be recognized as correct to replace the retorts by suitable chambers. As gas-retorts have been regarded for almost forty years as the model for coke-ovens, so must the retorts in turn be modelled on the latter. Whether this reversal will be accomplished, and, if so, after what lapse of time, must be discussed later.

NOTES ON SUBMERGED WATER-PIPES.

At the Sixth Annual Convention of the Central States Water-Works Association, held in Indianapolis towards the close of September, a paper on the above subject was read by Mr. A. L. Holmes, of Grand Rapids (Mich.) The following abstract appeared in a recent number of the "Engineering Record."

In the larger cities along the navigable waters care must be taken that the pipe-lines are beyond the reach of keels or propeller wheels, and the pipe protected at the docks and landings. About the only safe way for laying pressure pipes across navigable streams is to place them in a trench well below the bottom of the river, and in this trench pipe carefully laid will give no trouble. If the bottom is soft, there is little difficulty in dredging a trench; and if rock, it can be drilled and blasted from the surface, and the loose material cleaned out of the trench. Most of it can be removed from above; but it will pay to send a diver down to be sure of a clean channel before sinking the pipe. In some localities with soft bottoms, it has been a custom to lay the pipe on the mud with the upper ends disconnected, and then, by a sand-pump working along the line of pipe, gradually work it down to its place. It is obvious that where this can be done in sand or mud the pipe will keep in the bottom of the trench and save the handling of some material. Constant vigilance is necessary in all this class of work.

At Michigan City (Ind.), a 20-inch force-main across the harbour was lowered from a depth of 16 ft. 5 in. to a depth of 20 feet by the use of a sand-pump, and without any repairs whatever. This pipe was 160 feet long, and was fitted with five ball-joints. Together with 1200 feet of other pipe on shore, it showed a leakage under 100 lbs. of water pressure of only 168 gallons in 24 hours. A 16-inch riveted pipe across the stream at Hammond (Ind.) was lowered in this way, and by the use of a water-jet; and it was perfectly tight when down. Of course, this way of doing the work is not advocated where it is practicable to get and to maintain a trench otherwise; but some streams are so swift, and carry so much fine sand or silt, that the trench would fill as fast as it was dug. The writer's preference for submerged pipe is cast-iron hub and spigot, with lead joints, and at every 36 or 48 feet a flexible joint that will allow of considerable movement.

Wrought-iron pipe is used to a large extent by private concerns, and there is a sufficient spring to a 6-inch pipe with several joints to conform to a quite uneven surface. A flanged cast-iron pipe for this work will be expensive to lay, and probably cause trouble from leaks. With medium-size pipe—say, up to 12 inches—the work of jointing and getting in place can be done from above water. In one case under the writer's charge, a line about 200 feet long was sunk in 20 feet of water lowered from the sides of scows by ropes. It showed no leaks at the time, neither has it in the eighteen years which have elapsed since it was placed.

Of course, many of these lines leak unknown to the water-works managers. The best way to ascertain the amount of the leakage is to place a valve at each side of a river crossing with a bye-pass around it in which to place a meter. With the valves closed and a pressure on the meter, the leak can be measured quickly. To locate the leak, the writer has found the use of an air-pump the most efficient and the quickest means. With the valves closed and the air under pressure introduced into the submerged pipe, the air bubbles coming to the surface will locate the leaky joints very quickly.

In many streams where not interfered with by boats, pipes are jointed on a frame of timber sloping toward the stream; and as each length is added, the pipe is launched into the water. The outer end is supported by floats, and as the pipe goes out floats are added about every 24 feet, until the whole line is put together. It is then gradually lowered by long screws or ropes to the bottom. In some small streams and in a moderate depth of water, the writer has used benches built of 2 in. by 6 in. and 4 in. by 4 in. timber set in the ground or bottom of the stream; and, putting the pipe together on these platforms, has easily lowered it to the bottom. The placing of coffer dams and the laying of pipe in them, where practical, offers no objections to doing good work; but it is generally very expensive in operation.

In laying 24, 30, and 36 inch pipe in deep water, the writer has connected 40 feet with lead joints in the usual manner, placing on each end of the section half of a bolted ball-joint, and lowering this into the trench prepared for it, holding one end off the bottom with a piece of wood 8 inches square placed under the hub as the pipe was lowered to its place. The next section, prepared in the same way, is also lowered, and while in the slings and held just clear of the bottom the diver guides the ball into the bell and bolts it up, and so the process is continued. The writer does not advise an attempt to get pipe very closely in line. If it zig-zags a little it may keep tighter if it settles at all. In river crossings, a curve up stream is generally desirable, so that as the current washes out under it, and it works down stream, it will become tighter.

In suction pipes in lakes, the writer advocates the submerged crib or intake; and in most cases wood is cheaper and preferable for this purpose. In the great lakes, where there is navigation, the outer end of the intake should be placed in 40, or preferably 50, feet of water. Ice drifts on to the shore, and piles up and sinks until it is 30 feet deep. This must be watched and guarded against if possible. There is much less danger of obstruction to the water supply if a submerged crib is used than if it reaches above the surface. Just as efficient protection is furnished by an upturned elbow on the end of the pipe in which is inserted a T-piece of the same size, the ends of which are barred, leaving openings about 3 inches wide. Around this drive 12 piles 10 feet in the bottom, cut them off 2 feet above the top of the elbow, and rip-rap about this to the top of the casting, and it is perfectly safe.

All intakes and suction-pipes for large plants should terminate in a reservoir or pump-well on shore, to which the water should flow; and while pipes should be so planned that the pumps can operate directly on the intake, it is better that the pump-well or reservoir should have screens to shut out all foreign matter, and be large enough to allow sedimentation to take place, if there is anything in the water. All intake-pipes should have valves placed at the outer ends and near the well, with provision for closing both, and testing, under pressure through a meter, for leaks, and with air to locate them. Leaky suctions, whether on shore or under water, are the terror of the pumping engineer, and reduce the efficiency of his machinery and ruin his engines. A little care and persistency will find and stop the leaky pipes, and save annoyance and coal bills. All suction and intake pipes should, of course, be laid to a grade that air pockets may be avoided.

The writer would always insist on an efficient and easy way to test every pipe of this kind in use; and he considers that all submerged pipe should be looked upon with suspicion. He once removed an intake laid in the bed of a muddy lake, the outer end in 30 feet of water, which, when laid ten years before, had been broken into five pieces, and had sucked in the disease-breeding filth about 100 feet from the shore, and sent it through the town, instead of getting the pure water through the 1200 feet of pipe as intended. The experience at Duluth a few years ago, where the intake was discovered broken in several places, and where typhoid was rampant, evidently from this cause, is another instance. Neither could have happened if provision had been made for the test mentioned, and it had been enforced as it should be.

Owners of a plant taking water from wells across a small pond from their pumping-station sunk a line of spiral riveted pipe for a suction, and could not lower the wells at all; but an outbreak of typhoid, and an investigation and analysis of the water, disclosed the fact that the water in the town was identical with that in the filthy pond, and entirely unlike the well water. Upon taking up this pipe, a connection was not only found through a T-piece with a check-valve a few feet from the shore, but some lengths of the pipe had become detached, and the reason for the sickness and deaths was discovered.

"Out of sight out of mind," is apt to be the rule with submerged pipe. But if water-works managers will look after these under-water force-mains, they will in many cases find where a lot of the water they pump goes to; and if they will test their suction-pipes going out to good water, they will find them drawing in the filth and dangerous poisons in the mud near the shore, and will learn reason for a good many disease germs found in water taken from the faucets, when an analysis at the intake shows nothing of the sort.

INFLUENCE OF THE NATURE OF THE NET FIBRE ON THE DURABILITY AND LIGHTING POWER OF MANTLES.

Dr. Killing has lately made, and described very fully, some investigations with the microscope of mantles woven of different descriptions of fibre. His investigations have been dealt with in the "Journal für Gasbeleuchtung," both by Dr. Scharrer and himself, and the following is an epitome of the communications.

The fibres of real technical value in the incandescent mantle

industry include cotton and ramie. The latter is a fibre derived from a species of nettle found in the East. From the threads of ramie or cotton, the net is made, impregnated, burnt off, and then collodionized. This describes in a few words the process of mantle manufacture. Microscopic pictures have been obtained, to show the changes undergone by the fibres, in the course of mantle production, as well as the changes which the filaments of the ash, &c. (the impregnated mantles after incineration contain, as is well known, 99 per cent. of thoria, and 1 per cent of ceria), undergo from the first to the three-hundredth burning hour on the ordinary incandescent burner having a consumption of about 4 cubic feet of gas per hour. Microscopical investigations have also shown that the cotton thread consists of about 270 single fibres; while the ramie thread has only about 90 single fibres. The transverse section is, therefore, much greater in ramie fibres than in cotton. This remains the case after the impregnated net has been incinerated. Ramie mantles contain only about one-third the number of fibres which there are in mantles produced from cotton; but each filament of ramie ash has almost three times as great a section as a filament of cotton ash. It therefore appears that the thicker filament of ramie ash melts in a bunsen flame just like a thick platinum wire—less easily than the thinner filament of cotton ash.

Dr. Killing offers this as an explanation of the better form of the ramie mantles. During use they do not so easily become distorted as cotton mantles. In proportion as a mantle produced from cotton frits, or the separate filaments, and hence the whole skeleton, run more together, its lighting power decreases more than that of a ramie mantle. Evidently therefore some relation subsists between the thickness of the filament and the durability of mantles in respect of illuminating value and resistance to heat.

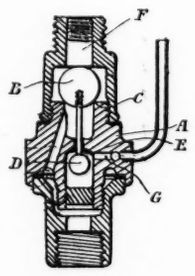
The advantage of ramie as regards greater duration of lighting power is minimized by the fact that ramie mantles have not the firmness of cotton mantles. This weakness shows up especially when the incinerated ramie mantle is collodionized, and then carried about. Observations must be extended to a large number of mantles in order to answer the question whether a ramie mantle set up on the burner without having been collodionized, is weaker in regard to vibration than a cotton mantle. It would appear that the ramie mantle is not much inferior to the cotton mantle in this respect.

Dr. Killing has pointed out that the reason of the excellent behaviour of ramie mantles is not to be looked for in the quantitative and qualitative proportions of ash in the untreated net. The reason up to the present remains a mystery. Dr. Killing believes that experiments he has made suggest an explanation, but he admits that many more will have to be made, to determine the relations accurately. Dr. Killing, in conclusion, has remarked that mantle ash can easily be microscopically investigated, as the shape of the fibre with the peculiarities mentioned cannot be easily imitated.

REGISTER OF PATENTS.

Incandescent Burners and Fittings.—Suggate, A. A., of Brixton, S.W. No. 20,278; Oct. 10, 1901.

This invention relates to improvements in connection with gas burners and fittings for use in connection with incandescent gas lighting—particularly for burners employed in public installations where a series requires to be controlled from one bye-pass or central tap or main cock.

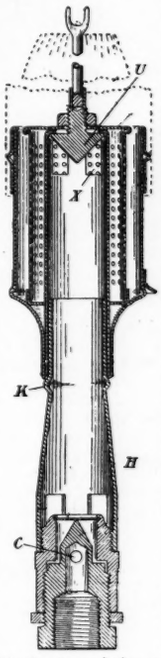


One convenient manner of carrying out the invention is illustrated—viz., a burner for use in a system where it is necessary for the pilot light to be burning when the main burner is extinguished, and for the main burner to be burning when the pilot is extinguished. To effect this, a plug or union-piece A is arranged, within which is a double-ended valve B D. The larger valve seats upon a specially formed bed C within the plug, and so prevents and controls the passage of gas to the main burner through F. The lower end D of the valve seats upon a bed E, and controls the passage leading to the bye-pass supply only through G; the arrangement of the seats within the plug or union being such that the larger valve B remains on its seat C when the lower pressure is passing through the plug or fitting A. The smaller valve D is then opened, and the smaller valve is carried upon its seat when the larger end of the valve is opened by the increased pressure. By this arrangement, it is impossible for both valve openings to pass gas at the same time, as one valve cannot be on its seat while the other is in this position.

Burners for Incandescent Gas-Lighting.—Wiederhold, O., of Bloomfield, N.J., U.S.A. No. 12,409; May 31, 1902. Date claimed under International Convention, Nov. 4, 1901.

The patentee claims a burner of the form shown—combining suitable means for distributing the air and gas mixture to the flame, and a mixing-chamber and a feeder-tube for delivering the air and gas to the mixing-chamber at a high velocity; the feeder-tube being substantially straight throughout its upper portion.

The operation of the burner is as follows: The gas is admitted through the opening of the regulator C, and passes upward into the feeder-tube H; air entering the burner through the lateral apertures K in the feeder-tube. Naturally, the mixture containing the most gas is in the centre of the mixing-tube; and it is one of the objects of the present invention to produce means whereby this rich gas mixture may be efficiently distributed to the outside of the flame, so that it will burn on the outside of the bunsen flame next to the mantle, where it can get the most oxygen from the air to ensure perfect combustion.



This is effected as follows: The air and gas mixture passes upward into the mixing-chamber, being given a powerful movement of propulsion owing to the shape of the feeder-tube. In the mixing-chamber, the speed of the air and gas mixture is slightly checked, and it passes laterally outward through the apertures X—being deflected and distributed by the cone-shaped spreader U. As the gas passes through the openings in the shell of the mixing-chamber, it impinges upon the cylindrical sieve. In consequence of this construction, the richest gas mixture which passes up the centre is deflected outwardly against the top openings of the sieve, and that which passes up the sides of the mixing-chamber goes out through the lower portions of the apertures in the mixing-chamber shell. It thus gets a downward movement between the mixing-chamber and the perforated shell or sieve. As this outside portion of the air and gas mixture has less velocity than the centre portion, it passes upward immediately on the outside of the sieve, burning on the inside of the bunsen flame. The mixture from the centre of the mixing-chamber, by reason of its higher velocity, is thrown downward by the spreader, and burns on the outside of the bunsen flame.

It will, says the patentee, also be observed that, theoretically the higher the gas pressure, the greater is the resistance of the poor mixture gas in passing by the rich mixture gas as it comes out of the top of the sieve. "Thus, naturally, the burner mixes its gas and air automatically, and, consequently, it does not require an air-shutter. Hence there is no blackening of the mantle arising from imperfect combustion."

Gas-Engines.—Piers, E. F., of Horsham. No. 18,832; Sept. 20, 1901.

This invention has for its object to utilize more efficiently the force arising from the explosions of a mixture of gas and air in an engine working on the Otto system, by providing it with means whereby energy is stored up to assist in driving the engine, and practically the whole of the waste products of combustion of the explosive mixture are expelled from the cylinder before a fresh charge of explosive mixture is admitted.

Fig. 1 is a longitudinal section of a gas engine cylinder so fitted; the parts being shown in the position they occupy when the piston has just finished the driving out of the waste products of combustion. Fig. 2 is a similar view when the piston has finished compressing the charge.

Fig. 1.

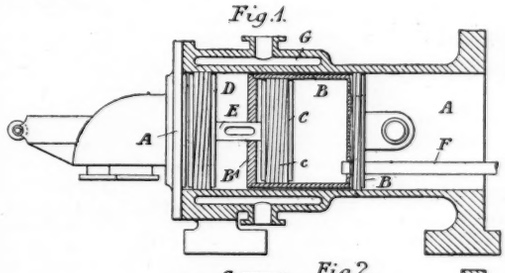
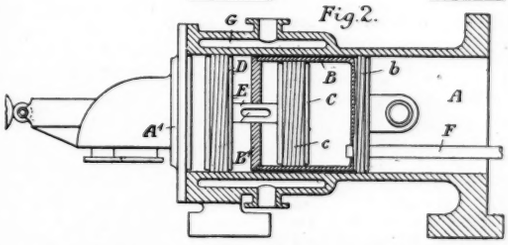


Fig. 2.

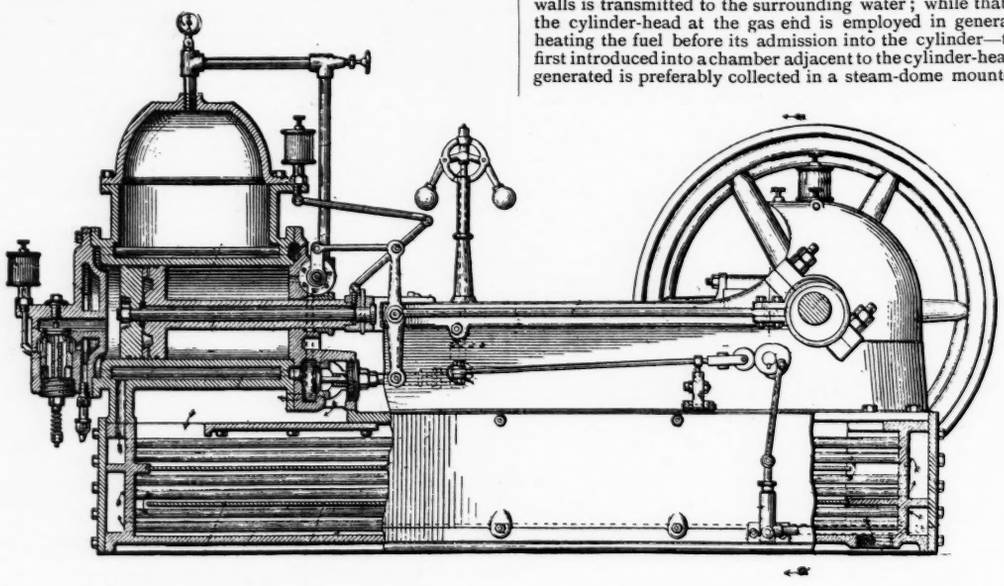


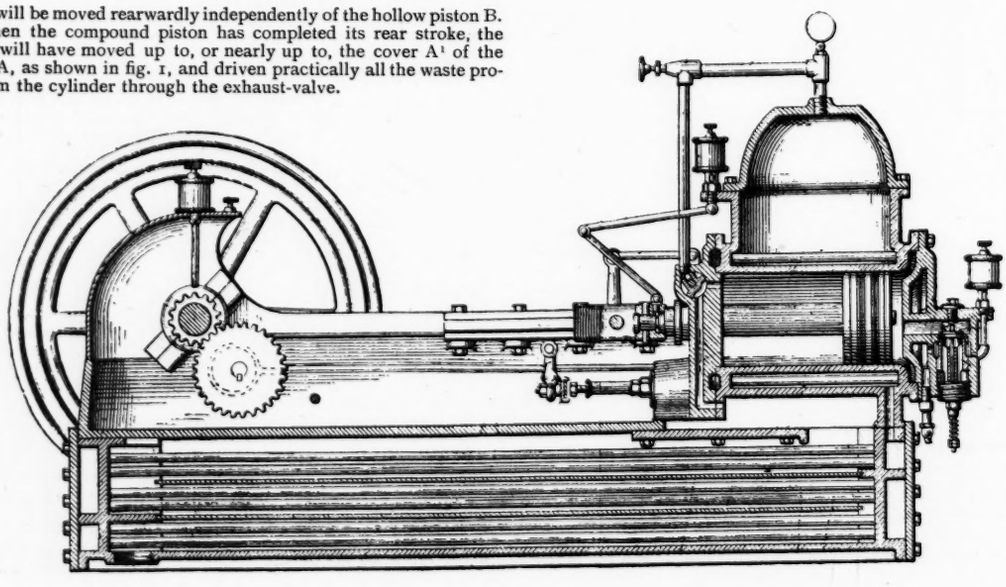
A is the cylinder of an engine working on the Otto system, in which is fitted to slide a compound piston comprising three pistons B, C, D. The piston B is in the form of a hollow cylinder sliding in the main cylinder A, and provided with packing rings which bear against the walls of the cylinder A. The piston C similarly slides in the cylinder B; and the piston D slides in the cylinder A behind the cylinder B. The pistons C and D are connected together by a rod E passing through a hole or bearing in the end cover B^1 of the cylinder B, and having in it a lateral passage by which air can pass to and fro to either side of the end B^1 of the cylinder when the pistons C and D are in certain positions; the air forming a cushion between the pistons and the end B^1 of the hollow cylindrical piston B. The distance between the pistons C and D is equal to about one-fourth of the stroke of the engine *plus* the thickness of the cylinder cover B^1; but it varies according

to the extent of compression to which the explosive mixture is to be subjected. The lateral passage in the rod E is so situated, and is of such length, that, when the piston C is moving in the cylinder B, air can pass through the passage into and from the cylinder; but when either of the solid portions at the ends of the passage in the rod E enters the bearing in the cylinder cover B^1, the air between the pistons C and D and the cover B^1 is imprisoned, and acts as a cushion to prevent the pistons from knocking against the covers A^1 and B^1.

Between the piston C and the end B^2 of the hollow cylindrical piston B is a chamber into which compressed air is admitted by a pipe F. This compressed air expands when pressure is removed from the rear of the piston D; and by acting on the piston C, it drives the piston to the rear of the cylinder B, and consequently the piston D, which is connected thereto, rearwardly from the cylinder cover B^1 towards the end cover A^1 of the main cylinder A, so that when the compound piston completes its rear stroke, the piston D will be nearly in contact with the end cover A^1. A charge of explosive mixture is admitted to the cylinder A behind the piston D when in its forward position, and compressed by the rearward movement of the compound piston. It is fully compressed when the piston D reaches the position shown in fig. 2. The mixture, while being compressed, retards, to a certain extent, the movement of the piston D in the cylinder A, and, consequently, the cylinder B will slide on the piston C, so that the compressed air contained in the cylinder B, in the space between the piston C and the cover B^2, will then be subjected to extra compression equal to that of the explosive mixture.

When the mixture is thus compressed, it is ignited in the usual way, whereupon the explosion further compresses the air in the chamber of the cylinder B; and when the pressure in the cylinder A has fallen, by reason of the forward movement of the compound piston, the compressed air in the cylinder B, acting by expansion on the piston C, will cause the piston D to move rearward, and thus keep up the pressure of the exploded mixture to drive the compound piston forward. As the compound piston is about making its rearward stroke, the exhaust-valve is opened so that the pressure is removed from the rear side of the piston D, and consequently under the expansive action of the compressed air contained in the chamber in the cylinder B, the pistons C and D will be moved rearwardly independently of the hollow piston B. Thus, when the compound piston has completed its rear stroke, the piston D will have moved up to, or nearly up to, the cover A^1 of the cylinder A, as shown in fig. 1, and driven practically all the waste products from the cylinder through the exhaust-valve.





Combined Gas and Steam Engine.—Wise, W. L.; a communication from W. Heckert and H. W. Seney, of Ohio, U.S.A. No. 15,662; July 14, 1902.

The principal objects of the invention are to produce an engine combining all in one compact arrangement the essential features of a gas-engine and a steam-engine and boiler, and provide means for economizing in the use of fuel and more completely utilizing the heat of combustion in generating steam for driving the engine. Other objects are to provide for continuously and economically heating the feed-water during its passage to the water-space at or around the cylinder or combustion chamber, and for generating fuel gas from crude oil and preliminarily heating same before it enters the combustion chamber; to utilize the combined action of steam and explosive gases as a motive power, and to further utilize the heat of combustion in re-heating or superheating the steam which is being used as a propelling force, thereby lowering the temperature of the piston cylinder, which is used as a combustion chamber; and finally to provide an improved machine of the character referred to which shall occupy but little space while possessing great power.

In carrying the invention into effect, the gas and steam are automatically and at different intervals introduced into a piston cylinder (see illustrations) at opposite sides of the working piston, which is thus impelled in reverse directions by the motive forces. The cylinder is preferably provided with an outer shell or casing, the intervening space between which and the inner shell or cylinder proper is made to serve the double function of a water-jacket and steam-boiler. Any suitable charge of gas and air may be intermittently admitted into the gas end of the cylinder; the fuel or mixture used being determined and regulated with reference to obtaining the greatest production of heat and the highest expansive power. The gases, after expanding and spending their force against the piston, instead of being exhausted and wasted at a high temperature (as in ordinary gas-engines) are utilized as furnace gases of combustion; being conveyed in suitable flues which pass through the water-space of the boiler or water-jacket, and then further conveyed through or around a descending series of flues or passages so as to gradually heat an ascending column of feed-water, and are finally exhausted at a low temperature. The heat taken up by the cylinder walls is transmitted to the surrounding water; while that absorbed by the cylinder-head at the gas end is employed in generating gas and heating the fuel before its admission into the cylinder—the fuel being first introduced into a chamber adjacent to the cylinder-head. The steam generated is preferably collected in a steam-dome mounted above the

combustion chamber, and conveyed directly to a steam-chest for introduction in the usual manner into the steam end of the cylinder. It here impels the piston at each forward stroke of the engine, and is preferably exhausted with the waste products of combustion through heat-flues surrounding an ascending column of water, whereby the steam is condensed as it descends, and may be returned by the feed-pump.

The patentees claim that they thus provide a highly efficient and economical motor, the relative power of which is greatly increased beyond that of either the gas or steam engine; the motor having an additional impulse over the gas-engine at each forward stroke, thus securing more uniform speed as well as greater power, and the heat of the motive gases is completely utilized. Moreover, the heat taken up by the cylinder walls at each ignition of the gas serves to reheat or superheat to an extent the steam next admitted and increase its expansive power; while the steam, in connection with the surrounding water-space, reduces the cylinder walls to a lower working temperature than is attainable by water-jackets alone in the ordinary gas-engines, and serves also to lubricate and preserve the sides of the cylinder and piston—thus considerably prolonging the life of the motor.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Affairs of the Greenock Gas Department.

SIR,—In the telegram from Mr. Ewing which appeared in your issue of the 14th inst., it was stated that he was "writing a reply to the letter of Mr. T. Mitchell." But, to my great astonishment, Mr. Ewing's letter last Tuesday opens up a question on which I have not, in all the correspondence, ventured to express an opinion.

The great fault of Mr. Ewing is that he is too ready to "infer;" and in his letter (as in a good many other matters since he came to Greenock) he has been apt to "infer" too much and most unwarrantably. Mr. Ewing says Mr. Mitchell "should take his complaint to the Town Council of Greenock, and have his position vindicated there." Here Mr. Ewing is able to "infer" what never happened, as I have made no "complaint." Again, Mr. Ewing says: "It is only natural that Mr. Mitchell should advocate stoking machinery at any cost and under any circumstances." Here, too, Mr. Ewing does "infer" what has never taken place. But if Mr. Ewing could prove I ever did what he now asserts, then I claim him as a convert, because when the "large capital expenditure was recommended by the contractors," and which I opposed at "the Town Council of Greenock," Mr. Ewing warmly supported it in these words: "The scheme meets all the requirements necessary for fully equipping the retort-house with suitable retorts and automatic coal-handling plant, which will greatly reduce the cost per ton of coal carbonized." Mr. Ewing goes on to say: "I consider it my duty to make the best of the existing adverse circumstances. . . . At the same time, while I am succeeding with the remnant of the old carbonizing plant introduced 30 years ago in effecting economies sufficient to meet the increased capital charges incurred by machinery which cannot be worked economically . . . reducing the debt and deficiency incurred during Mr. Mitchell's term of office."

This is no doubt pleasant reading; but it is pure fiction. In the first place, there is not a single retort of the "old carbonizing plant introduced 30 years ago" at work in the Inchgreen works. Mr. Ewing must know this fact. In the second place, the price of gas to consumers was increased two years ago by 5d. per 1000 cubic feet; and it is by the extra income from this source—amounting to over £5000 per annum—that "the present Town Council are . . . reducing the debt and deficiency incurred during Mr. Mitchell's term of office" of £2606. If that is what Mr. Ewing calls "effecting economies," then how much would he suggest should be added per 1000 cubic feet to cover extravagances?

But to come back to the original subject and to Mr. Ewing's first letter on the quantity of coal used and the cubic feet of gas taken from each ton during the year ending June 30, 1902, I shall be pleased to have Mr. Ewing's attention. In that letter Mr. Ewing says "your correspondent is . . . correct in quoting a make per ton of 10,215 cubic feet for a period of ten months in the year ending June 30, 1902." What I want to know is how Mr. Ewing arrives at the above statement. I want no equivocation; and I now affirm that the above statement is beyond proof. I tell you why. In the Manager's stock-book, which is kept at the works, I find the following:—

Coals in Stock, June 30, 1902.

Kind.	Total.		Rate.	Amount.
	Ton.	Cwts.	s. d.	
Cannel	290	0	15 4	£222 6 8
Shale	266	15	13 4	177 16 8
Poniel W/Seam . . .	588	0	13 1	384 13 0
Heding and Nuts . . .	1538	10	11 10	910 5 7
	(*) 2683	5		£1695 1 11

And that "amount" is taken credit for in the "honest" balance-sheet presented to, and passed by, the Corporation as correct. Then in the Manager's "monthly report on workings," submitted to the Gas Committee at their meeting held on July 8, 1902, he states that on June 30, 1902, "the stock of coals was (*) 2456 tons," and that there were of "old contracts . . . to come 6327 tons;" and at the same meeting, the following report (dated June 27, 1902) on offers of coals was submitted: "I recommend a selection of 27,000 tons of coal at an average price of 12s. 1·96d. per ton, and with an average illuminating power in practical working of 24·5 candles; and this, added to the quantity to deliver against current contracts and the quantity in stock, makes approximately 34,771 tons, giving an average illuminating power of 23·4 candles, giving a probable yield of 347,770,000 cubic feet of gas. —(Signed) Wm. Ewing." When this report was considered, Mr. Morison, then Vice-Convener of the Gas Committee, pointed out that there must be something wrong with these figures, because he found that they amounted to 35,783, and not 34,771 tons as stated in the report. It was then agreed that the minutes be "approved of, on the understanding that the Manager reports to the next meeting of the Gas Committee the details of the approximate quantity of 34,771 tons referred to in his letter of June 27, 1902." And at a Gas Committee meeting held on Sept. 9, 1902, Mr. Ewing submitted this report: "The following is a detailed statement of the approximate quantity of 34,771 tons referred to in my letter of June 27:—

	Tons.
Selection of coals for year 1902-1903	27,000
Old contracts to deliver (approximately) June 30, 1902 . .	6,071
Coals in stock and at station at June 30 (approximately) .	1,700 (*)
	34,771

Now, what I wish Mr. Ewing to condescend to is to tell your readers as well as myself, which of his three statements—marked thus *—is the quantity of coal he had in stock on June 30, 1902. When he does this, I am satisfied it will be seen that the statement in his letter in your issue of Sept. 30 is absolutely incorrect.

THOS. MITCHELL.

Greenock, Oct. 24, 1902.

Institution of Gas Engineers.

SIR,—Without in the slightest degree wishing to raise any debateable question, I would suggest that, before the Articles of Association of the proposed Institution of Gas Engineers are finally passed, a clause be inserted, arranging for the use of abbreviated distinctive titles for those who are to be members, &c., of the new Institution.

Members of other societies connected with professions—of youthful age compared with that of gas engineers—seem proud to add their various distinctive letters to the end of their signatures. Even gas engineers are noticed with C.E., M.I.M.E., or other letters appended to their names. Surely a member of our profession ought to show that he is a gas engineer first, and then add as many other titles as he cares to possess.

With one main Institution for the gas engineering profession, it ought to be an honour to be connected with it; and, to enable those who are to be members, &c., to use the titles with authority, I would propose that, after clause 20 of the new Articles, an extra clause be inserted, on the same lines as that recently adopted by the Institution of Engineers and Shipbuilders—viz., "The abbreviated distinctive titles for indicating the connection with the Institution shall be the following: For Members, M.I.G.E.; for Associate Members, A.M.I.G.E.; for Associates, A.I.G.E.; and for Honorary Members, Hon. M.I.G.E." Trusting this will meet with approval.

A MEMBER OF BOTH INSTITUTE AND INSTITUTION.

Oct. 24, 1902.

Grid-Valves.

SIR,—Mr. R. J. Milbourne will, I am sure, pardon me pointing out a slight inaccuracy in dates in his "Communicated Article" on "Grid-Valves" which appeared in the "JOURNAL" last week.

In alluding to me as the inventor of "grid-valves" for bye-passing any tier or tiers of purifying material in a purifier, he states that I patented the invention in 1897. The date of my patent was long before that—viz., January, 1895.

It will be apparent, from the following extract from my patent specification, that Mr. Milbourne's patent of 1901 is an infringement of my patent of 1895:—

> Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is: (1) The fixing of a valve inside a purifier so that it may be actuated from the outside of the purifier while the purifier is at work. (2) The insertion of a valve through a layer of purifying material in a purifier in such a manner that the said layer of purifying material may be bye-passed when desired by simply opening the valve.

I should add, both for Mr. Milbourne's protection as well as my own, that I only permitted Mr. Milbourne's application for a patent to proceed on condition that a royalty be paid me by the manufacturers on every one of the valves made to his pattern, equal in amount to the royalty paid me for my own. An agreement was entered into to that effect.

I mention this for our mutual protection in case others, observing Mr. Milbourne's infringement, may be similarly tempted to infringe what is fast proving to be a most useful appliance in connection with the economical purification of gas.

An article setting forth the *rationale* of the operation, and entitled "Improvements in Working Gas Purifiers" appeared in the "JOURNAL" for March 24, 1896.

I am pleased to note that the example quoted by Mr. Milbourne confirms the favourable reports I have hitherto received of the usefulness of these valves. They are in use at many gas-works, and have been working at Sutton since August, 1895.

F. S. CRIPPS.

King William Street, E.C., Oct. 24, 1902.

Ownership of Private Waggons.

SIR,—I am pleased that this matter has been taken up by so well-known authorities. All private owners I should think would only be too glad to dispose of their rolling stock (and the worry the working of it involves) at a valuation to Railway Companies, if the disposers could in the least depend on an adequate supply of waggons afterwards. has, however—as one of your correspondents remarks—been tried on one of the principal railways, and utterly failed. Take, for instance, the spurt brought about by American and home strikes and rumours of

strikes that we have experienced during the last month or so, when I venture to say no merchant in any large way could get half his supplies forward owing to scarcity of waggons. (I refer, of course, to the suddenly increased demand from small merchants and householders.) The railways give the waggons to whom they like, and the collieries appropriate them to whom they like—to the detriment of people who have low-priced contracts. They must either find waggons of their own or wait until the rush subsides. It is always so.

Then, again, as to 15, 20, 40, or 60 ton waggons—leaving out the question of screens, sidings, &c —we must regard the many thousands of householders and dealers who would be quite unable to cope with trucks of larger capacity than 6 or 8 tons at a time, and the question of siding rent, where nowadays people are pounced upon for 6d. a day if a truck, from any reason, stands over four days. In some country districts, where coal has to be carted several miles, it would be difficult to deal with waggons of large capacity. Larger waggons will gradually come in, and have their use; but we shall never be able to do away with the present style of waggons—well, not for many years—nor can the enormous capital invested be ruthlessly swept away by demolishing the present rolling stock of the country as some suggest.

Birmingham, Oct. 25, 1902. G. J. EVESON.

Some of the Questions Involved in the Slot-Meter System.

SIR,—In your "Editorial Notes" of Oct. 14, you refer to all the speakers taking part in the discussion at the Midland Association meeting as being satisfied that their charges are profitable. That *may* be; but the propositions in the paper referred to were not submitted to show that there is a tendency for "slot business" to cause loss to gas undertakings altogether, but rather to point out that, where the average consumption per slot consumer is small, the ordinary consumer has a grievance, as he is made to make up the necessary profits; and that where the average or individual slot consumption is high, the slot consumer in many cases is charged an annual tax because he is supplied with a few cheap fittings. It is a most iniquitous tax, to my mind, and the greatest possible drawback to the obtaining of high averages. Do away with "free" fittings – the cause of so much clerical work and which necessitate the tax, either by the deferred payment or any other system—and the gas can then be sold for 6d., 9d., or 1s. (according to whatever the ruling extra charge is) less per 1000 cubic feet. Is not this an advantage to the slot consumer? The slot consumer would very soon answer the question if it were put to him.

Nuneaton, Oct. 24, 1902. G. HELPS.

Meter Dials: A Suggestion.

SIR,—It is somewhat surprising, considering all the improvements made of late years in meter construction, that so little improvement has been attempted with the dials. The trumpery little faces, having a finger resembling a flattened tin-tack, have been sufficiently abused. The reading of a gas-meter indication (omitting the delights of interpreting water and other meters) remains as much a puzzle to the majority of consumers to-day as ever. All gas undertakings are most anxious that consumers should take an intelligent interest in the quantity of gas consumed; but the difficulty is the reversal of the reading of the dials. Among a multitude of subjects, this is one deserving of more than a passing notice at the hands of the meter fraternity.

Huddersfield, Oct. 23, 1902. EDWARD A. HARMAN.

Vagaries of Meter Registration at Taunton.

Referring to the paragraph under this heading in last week's "JOURNAL," a correspondent writes: "It might be worth while to ask, *pro bono publico*, whether there is any truth, and how much of it, in the statements circulated that other electrical undertakings adopt the method of setting forward the indices of their meters on the ground, either real or supposed, that the said meter has not been registering the current passing through. I should be curious to learn the fate of any person who should make such a statement at a public meeting."

Assessment of Premises for Purposes of Water-Rate.—At the Greenwich Police Court, last Tuesday, before Mr. Baggallay, the Kent Water-Works Company were summoned, on an application by Mr. John Reeson, of 113, Shooter's Hill Road, Blackheath, for the apportionment of the annual value for water-rate purposes of the premises, pursuant to the Water-Works Clauses Act, 1847, and the Water-Rate Definition Act, 1885. Mr. Sewell, for the applicant, said the premises were formerly a private house, and later a shop was erected on the forecourt. The gross rental was £40, and the rateable value £34; but, inasmuch as no water was used in the shop, he contended that the Company had no right to assess that portion of the premises for the payment of water-rate, and should only levy it upon the private house for domestic purposes. They were not entitled to charge on the whole premises; and he urged that they should charge on a rateable value of £20 only, at which amount he estimated the value of the premises apart from the shop. He had had two similar cases against the Southwark and Vauxhall Water Company, who had acquiesced in his view. Mr. Chaydor, for the Company, argued that water was used for cleaning the windows and floor of the shop. He quoted the case of *Grand Junction Water Company v. Davies* (see "JOURNAL" Vol. LXX., p. 46), and argued that Mr. Reeson must prove to his Worship that the water-rate was chargeable on a part only of the premises. After a long argument, Mr. Baggallay said the whole building was rated and occupied together, and was in one occupation, and the summons would be dismissed.

LEGAL INTELLIGENCE.

KINGSTON POLICE COURT (COUNTY BENCH).

Thursday, Oct. 23.

(*Before Mr.* W. Y. COCKBURN *and other Magistrates.*)

Overseers of East Molesey and Molesey Urban District Council v. Hampton Court Gas Company.

A Reduced Assessment and Overpaid Rates.

These were two summonses against the Hampton Court Gas Company for non-payment of rates. The Overseers claimed £17 10s. for poor rate, and the Council £48 12s. 2d. for general district rate. The cases arose from an increased assessment which was placed upon the Company's undertaking in 1900, and which this year was reduced again on appeal. The Company have been paying, under protest, rates since 1900 on the increased assessment; and now that the figure has been reduced again, they contended that they were entitled to be credited with the amount (over £200) paid on all rates at the higher figure. The Council and Overseers denied that the Company had any right to such a return, and asked that the payment of the rates should be enforced.

Mr. SCARLETT appeared for the Molesey Urban District Council; Mr. EDGELL (Clerk to the Assessment Committee), for the Overseers; and Mr. MACKENZIE, for the Gas Company.

Mr. EDGELL said the Overseers of East Molesey had made a poor rate on April 3, 1901, in which the Hampton Court Gas Company were assessed at £505 gross, and £421 net. In respect to this assessment, a demand for £17 10s. was made; and he submitted that it was merely a ministerial act on the part of the Bench to enforce payment. He simply proposed to prove the rate, which, if it was good in the judgment of the Magistrates, would be sufficient for his purpose.

Mr. MACKENZIE: My friend knows my defence. They have money in hand which they ought to apply to this rate. He should, if evidence was to be called, show how they came to have the money in hand.

Mr. SCARLETT said he took the same view as Mr. Edgell. The words of the statute were that the rate was to be enforced there, unless good cause was shown to the contrary. The Company should therefore show cause. He was quite willing that the two cases should be taken together, so long as his own was not prejudiced by the adoption of this course.

Mr. *Goodall*, Assistant Overseer, was then called, and stated that the rate in question had been properly laid, and had not been paid by the Company.

In cross-examination, witness said the Company served two notices of objection—the first in November, 1900, and the second in January, 1901. Witness then received a letter from the Company saying that the Directors would appeal against the increase, but they would not do it until the valuation for all the parishes was in. In reply, he wrote the Company to the effect that the poor rate had been made on the increased assessment, and that they had to get all amounts in by March 25. Subsequently, the Company said they had been advised to pay the rate on the old assessment pending the appeal, and enclosed cheque for the amount they were in the habit of paying. The balance of the rate was paid in February.

Mr. EDGELL said the first notice of appeal was withdrawn.

Mr. MACKENZIE: Who withdrew it? I say it was not withdrawn. To make matters clear, we gave fresh notice in January, 1901; and whatever may have been done with the first notice, the second one has never been withdrawn. Continuing, he said that on Feb. 13 an interview took place between Mr. Cooke, for the Assessment Committee, and Mr. Castle, the Engineer (Mr. Price), and the Secretary (Mr. Lamb) for the Company; and it was then agreed that the question of the appeal should be held over. Five days later, the Company sent a cheque for the balance of the rate—under protest.

The CHAIRMAN: You are trying to get back the excess amount you have paid from the time the assessment was increased until it was reduced.

Mr. EDGELL: It is an entire novelty. They are trying to pay the current rate by what they say is an overpayment on previous rates.

Mr. MACKENZIE: I am entitled to one of two things. I am entitled to get this money back under the order of the Magistrates, or they may say the Overseers and Council have money of the Company's which should be applied in payment of this rate. We are perfectly satisfied that, having served notice of objection, we are entitled to have the balance overpaid either refunded or put to our credit on account of other rates.

The CHAIRMAN: It is very important whether the notice of objection was withdrawn.

Mr. MACKENZIE: It is immaterial whether the first notice was withdrawn, as we served a second one which in any case has never been withdrawn.

Mr. EDGELL (to witness): Have you ever, as representing the Overseers, arranged or promised to refund any amount to the Company?

Witness: No, never.

Mr. MACKENZIE: It is not a question of arrangement, but of legal obligation.

The CHAIRMAN: It appears to me that if it is a legal obligation you should go to the High Court.

Mr. MACKENZIE said this was an important matter in every way. The point he wished to submit was that there was ample authority for the contention that, where notice of objection had been given to an assessment, and the assessment had been reduced, the Overseers had no right to demand payment of the excess. Pending the decision of the appeal entered by the Company, the Overseers ought only to have assessed them at the old rate of £421. But the Company foolishly paid

on the increased assessment of £861, for this reason—that the Overseers and the District Council came to them and said they could not make their contributions in prospect unless the Company paid upon the full amount. This was how the difficulty had arisen. The Company, having given their notice of objection, paid under protest, pending the determination of the appeal, the full assessment; whereas the Overseers themselves should not have taken more than the amount on the old assessment. In the case of the *Queen v. Great Western Railway Company*, which was almost similar to the present one, the Company appealed against their assessment. The assessment was eventually reduced; and the Railway Company claimed that they were entitled to the amount overpaid on the rate objected to two years previously. The Overseers, on the other hand, contended that the decision only affected the rate then current. It was, however, held by the Queen's Bench that the "current rate" mentioned in the Act meant the rate current at the date of the objection two years before. He had also other authority of a like nature; the Judges having taken exactly the same view.

The CHAIRMAN: What does Mr. Scarlett say to that?

Mr. SCARLETT said the first rate in question here was that for November, 1900. If the Company had appealed against that rate, and had prosecuted their appeal in respect to that particular sum of money, and the appeal had eventually been decided in favour of the Company, if they had paid the larger sum then they would have had the balance allowed to them in respect of the next rate. This was different to the present case, where the Company made an objection, and then let the matter run on for something like two years, at the end of which time they made some other objection, and an agreement was come to which reduced the rating, after which the Company said: "Refund us all the money."

The CHAIRMAN: Do you contend that the Overseers were justified in rating the Company on the increased valuation?

Mr. SCARLETT said if he had to answer the question, he should say "Yes." When the assessment was reduced, new figures were brought up by the Company from more recent accounts—long after those for 1900—in which it was shown that the business was not so profitable. This had nothing whatever to do with the figures of 1900. These were merely facts; but as far as the authority quoted was concerned, the case was decided on a different set of circumstances altogether. The dispute had reference to a rate which was pending; and meantime the rate was paid on the higher assessment. There the Judge said: "This appeal is pending in respect of this particular rate. I think the 'current rate' means the rate at the time when the objection to the appeal was made." In the present case, the Company were claiming a sum of money from 1900; and if they had prosecuted the appeal against the current rate in 1900 and had succeeded, it would not have mattered if the question was decided in 1910—they would have been entitled to repayment of the overcharge on that particular rate.

The MAGISTRATES' CLERK: Was the objection adjourned, or was it withdrawn?

The CHAIRMAN (to Mr. Mackenzie): If you were not entitled to pay this amount, why did you pay it?

Mr. MACKENZIE: The reason we paid was because we had seen a paragraph in the papers to the effect that they were going to take proceedings to enforce payment. We always have been kindly disposed towards them, and did not wish to appear in Court to resist payment. They also told us it was necessary they should have the full amount; and we therefore paid under protest.

Mr. SCARLETT remarked that the Company were shifting their ground a little. The Solicitor to the Company, writing in September last to the Council, said: "I may say that my clients will contest the case, unless you can give credit for the amount overpaid on three rates, in pursuance of the agreement between the parties."

Mr. MACKENZIE said the agreement was come to at a meeting between Mr. W. G. Cooke, representing the Assessment Committee, and three gentlemen representing the Gas Company. It was agreed that the hearing of the objection should stand adjourned until the whole of the assessments for the different parishes had come in. The Company realized the difficulty the Committee had in ascertaining the value of the undertaking, which extended into several parishes, until they had the assessments for all the parishes before them. Mr. Cooke naturally suggested that the matter should stand over generally until they all came in. This was the agreement referred to; and the notice of appeal which the Company gave on Jan. 7 accordingly stood over.

The CHAIRMAN: The question is whether that notice was abandoned or withdrawn.

Mr. MACKENZIE said he was going to show that it was simply adjourned until all the assessments had come in. Following up the Great Western case, there was that of the *Queen v. Parker*, which was an appeal to Quarter Sessions in 1857—before the Union Assessment Committee came into force. In this case no order for repayment was made, as the Overseers were willing to allow the over-payment off subsequent rates. But the Poor Law Auditor intimated that he should not certify such allowance, as no order had been made at Quarter Sessions. The Overseers then went before the Justices for a distress warrant, which the Justices refused to issue. Thereupon the Overseers applied to the High Court for a mandamus to compel the Justices to issue a distress warrant. Lord Campbell, in giving judgment, said that to grant a mandamus in the case would defeat the intention of the Legislature, adding: "I think the Parish Overseers would do well to make the allowance; and I do not believe they would incur any risk in so doing." He cited this case to show that, where the Legislature had clearly intended that there should be a repayment or credit given for over-payment, the Court—whatever Court it might be—would allow this to be done. There was also a subsequent case, *Tynemouth Union v. Backworth Overseers*, which to some extent bore on the position. In this instance, there was a large ratepayer who had succeeded in getting his assessment reduced from £4000 to £2000, while the Overseers had paid to Tynemouth on the higher figure. The appeal extended over two years; and when the amount was reduced, the ratepayer said he was entitled to have back the money he had over-paid. The Overseers agreed; but the Tynemouth Guardians claimed the full amount from the parish. Proceedings were taken; and it was held that the Overseers were not bound to pay on the full amount. Mr. Justice Wills, in his judgment, said: "I do not see why the Guardians should not do the only honest thing that they can do, and either repay the money or give credit for it." Further on he said: "I think a specific enactment would be required to show they could not do it." It was true the Overseers did not appeal; but this was a pure matter of form. He also quoted another case—*Sheffield Water-Works Company v. Mayor of Sheffield*—to show that the whole tendency of the decisions of the Courts in matters of this kind was that where notice of objection had been given, and the assessment subsequently reduced, the ratepayer was entitled to have credit for the amount overpaid or the money returned. The Hampton Court Gas Company were summoned in respect of poor rate £17 10s.; while they overpaid in the rate of November, 1900, £18 6s. 8d. With regard to the general district rate, they were summoned for £48 12s. 2d.; while they overpaid in 1900 £52 5s. What the Company wanted was credit for the amount in hand. The matter it was agreed should stand over until the valuer for the Assessment Committee had been able to complete his valuation. This was not until last spring, so that the notice of objection given by the Company in January, 1901, stood over until this year. Then the Committee had the whole matter before them, and reduced the assessment from £861 to the old figure of £421.

Mr. *W. C. Lamb*, the Secretary of the Company, said that in November, 1900, the Company received an intimation that the assessment had been increased; and subsequently they had a demand for payment of poor rate on the higher figure. On receipt of the Committee's intimation, Mr. Castle was consulted; and he instructed witness to send in formal notice of objection, which he did. He attended before the Assessment Committee on Dec. 12 to support the Company's appeal, and asked for an adjournment because the figures for the whole of the parishes were required. Witness received a letter from Mr. Goodall, in which he said he had had notice that the appeal was to be heard on Jan. 9; but he had no request from the Assessment Committee to attend on that day. He saw a report in the newspaper about the appeal, and Mr. Castle advised him to put in a fresh notice, which he did on Jan. 7.

The CHAIRMAN: Is there any pretence for saying that the notice of Jan. 7 has been withdrawn?

Witness replied that there was none whatever. He received notice to appear before the Assessment Committee on Feb. 13, and attended along with Mr. Price and Mr. Castle. When they were together in the station yard outside the Assessment Committee's offices at Norbiton, Mr. Cooke came up and spoke to them. They had a conversation as to the difficulty of going into the Molesey figures until the figures for the other parishes were available. Eventually it was mutually arranged that the Molesey figures should stand over pending the receipt of the others, so that then Mr. Castle could go into the matter again and deal with it once for all. It was an agreement entered into with Mr. Cooke that the whole matter, including the notice of objection, should stand over until the other assessments had been ascertained. With that they left it in Mr. Cooke's hands to make arrangements with the Assessment Committee—he being the representative of the Committee. The Company afterwards paid on the increased assessment, on the distinct understanding that any allowance due should be made.

Cross examined: He had never written to the Assessment Committee stating that the appeal was standing over by consent, because Mr. Cooke came out from the Committee for the purpose of conversing with them. He did not know that the practice of the Committee was that appellants were called, and if they did not respond their appeals were struck off.

Mr. SCARLETT: Have you ever prosecuted that notice of appeal of January, 1901? Did you ever appear in support of it before the Committee?

The CHAIRMAN: Have you ever withdrawn it?

Witness: No.

Mr. SCARLETT: The appeals were called on at meeting after meeting.

The CHAIRMAN: The assessment has been reduced.

Mr. SCARLETT: Yes, but on new figures entirely.

The CHAIRMAN: If you speak from to-day till to-morrow, you will not persuade the Magistrates that this money ought not in equity, and they believe in law, to be returned.

At this point Mr. Cockburn left the Bench, and the chair was taken by Mr. J. Thornely.

Mr. *W. H. B. Castle* said that in 1900 he made a valuation of the whole of the Company's property. He attended with Mr. Lamb and Mr. Price at the Assessment Committee's offices, and Mr. Cooke came outside and joined them, when the matter was discussed. The result, so far as witness understood it, was that the whole question was allowed to stand over till Mr. Cooke had finished his valuation of the Company's property. If this course had not been assented to, he was prepared to go before the Assessment Committee.

Mr. EDGELL said his case was that there was a rate made in April, 1902, based upon an assessment of that year by Mr. Cooke; and this was the only claim the Overseers were making. It was merely a ministerial act of the Bench to order the rate to be paid. He submitted that the common sense about all that had taken place was that there was a distinct abandonment of the notice of appeal, because there was no subsequent notice when the October, 1901, rate was made. That rate must therefore be payable at the higher valuation.

Mr. *W. G. Cooke* said he saw the representatives of the Gas Company at Norbiton, near the Assessment Committee's offices. He had an interview with them, because he was rather astonished to see any of them there. His conversation was principally with Mr. Castle; and no understanding was come to with regard to the appeal.

Mr. EDGELL: What was arranged?

Witness: The appeal was abandoned.

The CHAIRMAN: Why do you say it was abandoned?

Witness: Because there was nobody before the Committee at all.

Examination continued: Mr. Castle said something to this effect: "Your valuation for the parishes, when it does come in, will not exceed these figures here?" Witness replied that it would not; he would keep to the total. It was quite immaterial to the Company how it was divided.

The CHAIRMAN: Did any one of those gentlemen speak to you about abandoning the appeal?

Witness: No.

You said nothing to prevent them going in to the Committee?—No.

Mr. Scarlett wished to examine witness with regard to the difference between the accounts on which the reduced assessment was made and those on which the assessment was previously raised; but the Bench ruled this matter out.

Mr. MACKENZIE: The Magistrates are practically asked to issue distress warrants; and the only question is whether they are going to do so or not.

Mr. SCARLETT said the Council were suing for a rate which, *primâ facie*, they were entitled to have enforced without question. It was for the Company to show cause why this should not be done; and they said: "You have money in hand of ours amounting to £151; and therefore we ought not to be asked to pay." The answer was that they had nothing in hand, because what they received from the Company was a rate on a different valuation from that on which the reduction was made. Surely this was admissible evidence.

The CHAIRMAN intimated that evidence on this point would not be accepted.

Mr. SCARLETT (continuing) said the case of the *Queen v. Great Western Railway Company* did not apply to the present matter, because it only turned upon this—that where there was one current rate, and there was an appeal against that current rate which was not heard and determined during the currency of the rate, notwithstanding that the decision came after the currency of the rate had expired, the Railway Company were entitled to be credited with the amount overpaid. It had been suggested to the Gas Company that they should pay over the whole of the money, and that the difference would be refunded if an appeal during the currency of the rate was successful. But they would not accede to this. On Feb. 18, the Company were asked for the amount then due, and they paid it without mentioning a word about the interview at Norbiton a few days before. The case of the District Council stood on a different footing to that of the Overseers; and this was why he had said that he did not object to the cases being taken together so long as the Council were not prejudiced. If an agreement was come to between the representatives of the Company and of the Overseers to allow the appeal to stand over—to which the Council were not a party, and of which they were not informed—the Council could not be bound by it. The case of the *Queen v. Parker* did not apply at all. It was a question of mandamus, which was in the discretion of the High Court, and decided nothing regarding the matter now in dispute. As for the Tynemouth case, he was surprised at his friend quoting it. It referred to contributions by several different authorities to one larger authority. Practically, the only ratepayer in the district of the Overseers against whom that claim was brought was a colliery owner, who appealed against his assessment. There was an agreement entered into between all the parties that pending the appeal he should pay on the higher sum, and that if the appeal was successful the money should be refunded. The appeal was successful, and the money was returned; and then the Tynemouth Authority said to the Backworth Overseers: "You must pay the amount which has been disallowed." The Judges held that this was merely asking the ratepayer—*i.e.*, the colliery owner—to pay again in another way, *plus* the cost of the action. His friend had searched everywhere to find something to support him in his contention that, not only the rate of 1900, but intervening rates which had been paid and never objected to, must be reduced. The District Council were in the position that they could not make valuations; they were bound by statute to take the valuation that was given to them by the Overseers. They had the figure of £861 furnished them by the Overseers; and they could not question it, nor could they be a party to any appeal. All they were empowered to do was to make a prospective rate; they could not make a retrospective one. They could not carry on their business if things of this kind were to go on behind their backs, and if they were to be called on to refund money paid years before. Any question between the Overseers and the Company could not affect the Council. They made their rate, and the Company paid it without objection of any kind. Then after this the rate was paid several times in the same way; and not until the present year did they hear that an allowance was going to be made in the assessment. Then the Council sent in a new demand for the reduced amount; and the Company claimed a reduction on the sums paid on the higher assessment. He could find no precedent for anything like this. If it were held that rates could be paid by a counterclaim of this description, where would the District Council find themselves? Every ratepayer who had, or thought he had, some sort of claim against the Council, would go to the Magistrates. The only case he would refer to was one in which the Court refused to allow a promissory note which had been taken by the authority to be considered as payment of a rate; so that the man had to pay twice. It was held on appeal that the business of the Justices was ministerial only, and that they must make the order for the payment of the rate, without taking into consideration the promissory note which had been given. What would happen in this case? If the Company succeeded, the Council might be asking a different body of ratepayers in 1902 to refund the excess rate by which the ratepayers of 1900 benefited. No retrospective payments of this kind could be allowed by the Council. How were they to make up the difference? Should they levy a special rate for the amount? They could not do it, for it would be illegal. As regarded the District Council, the Company's argument was in the nature of a counterclaim; and he submitted that they could not possibly pay a rate by a counterclaim of this kind.

The CHAIRMAN, without hearing Mr. Mackenzie in reply, said the Bench had come to the conclusion, in both cases, that they could not make the orders asked for.

Mr. MACKENZIE applied for costs.

Mr. EDGELL said it would be a matter for consideration whether they should not apply to the High Court for a mandamus.

The CHAIRMAN granted the Company £5 5s. costs against each of the parties, and said the Magistrates would be pleased to state a case if desired.

MISCELLANEOUS NEWS.

PROPOSED NEW GAS-WORKS FOR COVENTRY.

A Scheme to Cost £180,000.

The increasing growth of Coventry, and the recent annexation of parts of Foleshill and Stoke, have rendered the present gas-works inadequate for the growing requirements of the city. On Oct. 30, 1900, the Town Council adopted a scheme for auxiliary gas-works at Foleshill; but since then circumstances have arisen which led to the matter remaining in abeyance. The question has, however, been reconsidered lately, with the result that the Gas Committee have now gone a step farther, and a scheme has been prepared for the erection of complete works for the manufacture of gas at Foleshill, at an estimated cost of £180,000. This is recommended by the new Engineer and Manager, Mr. Fletcher W. Stevenson.

Mr. Stevenson's report is very comprehensive, and gives all necessary information. He says: "I do not need to refer to the necessity for providing such works, as it has been realized by the Committee for a long time that the present works have far out-grown the site upon which they are built, and that the cost of working upon such a cramped site—without railway or canal connections—is very high. It has, however, been absolutely necessary before designing new works to decide whether they should be auxiliary only to the present, or whether the whole of the manufacture of gas should be carried out upon the new works, as upon this depends the size and cost of the section to be built within the next few years. The objection to removing the whole of the manufacture of gas to Foleshill is, of course, that a large quantity of plant and buildings at the present works will be rendered useless; but, on the other hand, there will be far greater economy effected in working if the whole of the gas is made upon one modern works (having direct rail and canal communication) than if a part is still made at the present works. I have given the most careful attention to the preparation of an estimate of savings that would be made by manufacturing gas on new works at Foleshill, and in doing this I have been careful to omit the doubtful points. I believe that the saving shown by the following estimate is rather under than in excess of that which will be realized. Estimate of saving effected if the quantity of gas made in the year ended March 31, 1902, were produced upon new works at Foleshill: 46,955 tons of coal discharged at Coundon Road and put into stores at 11½d. per ton, £2203; less cost of same at the new works, at 3d. per ton, £587; Railway Company's terminal service charge on coal, £391; Railway Company's terminal service charge on 4082 tons of oil, lime, fire-bricks, clay, cement, and all goods (except coal) received at Coundon Road, £67; cartage of coke, tar, lime, bricks, &c., to and from Coundon Road, and labour loading material into carts, £563; cartage of sulphuric acid and sulphate of ammonia, £83; less haulage of railway trucks at new works, £92; profit on increased quantity of sulphate of ammonia made per ton of coals carbonized, £498; reduced cost of carbonizing coal at 8d. per ton, £1565; reduced cost of purifying gas at ½d. per 1000 cubic feet of gas sold, £588; less increased cost of carting coke sold in Coventry at 1s. 6d. per ton, £750; total, £4529. The amount is equal to £7 19s. 2d. per million cubic feet of gas sold, and is sufficient to meet interest and sinking fund at 4½ per cent. on upwards of £100,000 capital. If the works at Foleshill are made only auxiliary to the present, the above saving would, of course, be reduced proportionately, and in addition it would further be reduced by having to provide a new Manager and staff of foremen, which would cost not less than £700 a year. In the face of these figures, I am compelled to advise you that the first section of the new works should be built of such size that, when ready, the whole of the gas should be manufactured at Foleshill. The present works would then be retained for a storage and distribution station, and also for a depôt for the mains and services and fittings departments. The portion of the manufacturing plant that would be discarded I estimate at about £50,000; and this ought to be written off capital, less any sum realized by the sale of the material and amount received from sale of land not required. The first section of the new works at Foleshill I advise should be of capacity to produce per 24 hours: 3 million cubic feet of coal gas, 1½ million cubic feet of carburetted water gas; total 4½ millions. At the present rate of increase, I estimate that this capacity will last for 10 to 12 years from the present date. The following is my estimate of the cost of the works for the capacity I have given: Retort-house and coal-stores, with equipment to produce 3 million cubic feet per diem, £52,000; boiler-house and boilers, £2850; condensers, £1800; exhauster and engine-house, exhausters, &c., £2100; scrubbers, washers, &c., £3100; tar and liquor tanks, £5000; purifiers and lime and oxide sheds, £12,250; meter house and meter, £1620; gasholders and tanks (capacity about 3 million cubic feet), £44,800; governors for supply of Foleshill district, £200; pipe subway under railway, £1420; workshop, stores, manager's office, laboratory, and equipment, £4800; entrance gates, offices, and cart weighbridge, £500; railway sidings and canal dock, £2630; roads, drains, &c., £1500; gas, water, liquor, tar, and connecting pipes throughout, £3000; locomotive engine and shed, £1000; two railway-truck weigh-machines and offices, £400; sulphate plant and buildings, £5700; less value of existing plant, £2000; main from Coventry for the conveyance of liquor, £1650; mess room, lavatories, &c., and water tank, £500; carburetted water-gas plant, with purifiers, relief holder, and oil tank complete, £17,500; main to connect Coventry and Foleshill works, £12,000; allowance for contingencies, £3680; total, £180,000."

Mr. Stevenson considers that the gasholders, sulphate works, and liquor tank should be proceeded with without delay. The gasholders will take two years to build; and therefore, unless the contracts are let within the next two months, they will not be available for the winter of 1904. The construction of the larger portion of the works, which consist of the plant and buildings for the manufacture of gas, can be spread over two or

three more years—being brought into use in 1906 or 1907. He estimates the cost of the work to be proceeded with at once at £65,000.

Dealing with the financial position of the undertaking when the new works will come into operation in four or five years' time, Mr. Stevenson points out that, on March 31 last, the capital raised was £298,656. Of this, £31,340 was redeemed—leaving £267,317 bearing interest, and for which a sinking fund has to be provided. The amount of interest and sinking fund for the year ended March 31 last was £11,650—equal to 4·36 per cent. on the actual capital. The gross profit realized for the same year was £13,096—equal to £23·23 per million cubic feet of gas sold. The average rate of profit per million cubic feet of gas sold for the last seven years has been £28.

In his summary of the financial position of the undertaking on the completion of the new works, Mr. Stevenson says: "Under the worst circumstances, there would be, when the works came into operation, an accumulated deficit of £5211, which would be reduced to £3388 after the first year's working on the new works; secondly, if the average profit of the last seven years be maintained, there would be, at the end of the first year's working upon the new works, a surplus of net profit of £8720. In conclusion, I beg to say that I am of opinion that the continued rapid growth of the gas undertaking, combined with the high cost of manufacturing gas at the present works, fully warrants the whole of the manufacture being transferred to new works, and that when this is done the capital expenditure will compare favourably with most other gas undertakings in the kingdom. In addition to this, the Committee will possess a modern works, on a site where further extensions can be made at moderate cost. And, lastly, the annoyance of having a gas-works situate within the city—entailing, as it does, the cartage over the streets of thousands of tons of material every year—will be removed."

QUALITY OF MANCHESTER GAS.

A Consumers' Protection Association.

A meeting of gas consumers was held in Manchester last Friday, under the presidency of Mr. J. Norris, for the purpose of considering the recent increase in gas bills, and the desirability or otherwise of forming a Gas Consumers' Association, and to decide the lines (if any) upon which the agitation or inquiry should proceed. Mr. Piggott explained that the meeting was the result of the expression of public opinion, and the agitation which followed Dr. Sinclair's case before the Magistrates last June. Very many people had found that, though they did not burn more gas, their bills were constantly increasing. When the Gas Committee were making so large a profit, they thought there must be something wrong. Mr. Hartley said that he was an analyst, and had gone thoroughly into the matter for his own satisfaction. He had made an apparatus which registered the pressure of the gas, and had tried it in the Isle of Man and in Manchester. He had found that they had twice the pressure in Manchester that they had in Douglas. Mr. Fowler said the first point for them to find out was, Were the Corporation within their rights and had they parliamentary powers, to make water gas? The gas the Corporation at present supplied, if used at the ordinary pressure, would not give a proper light. The Committees were always trying to show profits, and their books did not indicate what the loss to consumers was; but they were robbing the rateyayers in order to make large profits. He suggested that an inspector should be appointed to see that the gas produced was of the proper quality. Mr. Oppenheim, speaking as a solicitor, said if they could prove that the pressure of the gas as at present supplied was not what it ought to be, they could proceed against the Corporation. Alderman Gibson, the Chairman of the Gas Committee, had told him the Committee were willing that an inquiry should be made if the proposed Association would bear the expense. Dr. Sinclair said he had a very firm conviction that the community was being abused to a large extent by the quality of the gas supplied. If they formed an Association, the fact that it was in existence would make the Corporation officials much more careful. Then, again, as an Association, they would be much more ready to fight cases before the Magistrates than individuals would be. The work of such an Association would be only temporary; but while it lasted, it would be very valuable. One firm wrote to the meeting enclosing a report by an expert which said that water gas, owing to the very much larger percentage of hydrogen it contained, passed through the burner at a quicker rate than coal gas, and that Manchester gas was not of the illuminating power it was supposed to be. Another consumer said that for four nights his meter would not register at all, and a deposit came into it. When men came to see to this, he alleged that they went to the lowest point in the district, "poured oil down, and set it on fire." This he thought was a dangerous practice. It was unanimously decided to form an Association, and a Provisional Committee was appointed to draw up the rules.

LIGHTING PROBLEMS AT PLYMOUTH.

The Gas Company and the Corporation.

At the Meeting of the Plymouth Town Council yesterday week, the Electricity and Street Lighting Committee reported that they had instructed the Electrical Engineer to prepare an estimate of the cost of laying supply mains for the lighting of two back lanes which are beyond the limits of supply of the Plymouth and Stonehouse Gas Company. Alderman Radford, Chairman of the Committee, said that there were many dark lanes in the town beyond the Gas Company's limits of supply. They had been negotiating recently with the Company, but had not been able to make a satisfactory arrangement. The Company would go into front streets, where a lucrative business was to be done, but not into back lanes outside their limits. It had recently been decided by the Council that in the construction of new streets gas-mains should be laid in the back lanes and the cost charged to the owners; but there were a number of old back lanes which were inadequately lighted, and it was a costly business to put in the light which was required. The two referred to in the resolution were, however, so situated that the Committee felt they must be lighted whatever the cost might be. Several members called attention to lanes in the wards which they represented, which they thought equally worthy of attention; and mention was also made of Laira Embankment Road, a mile in length, now wholly within the borough, and belonging to the Corporation, in which there is no light. The Committee's recommendation was approved.

At the same meeting, Alderman Radford stated that the Electricity Committee had considered an application from one of the local newspapers for a supply of electricity for power purposes between the hours of midnight and 6 a.m., and had offered to furnish the current at 2½d. per unit. The charge for electricity for the Corporation tramways had been reduced from 3d. to 2½d. per unit. Really, the trams and the electricity works were a joint undertaking, and they ought not, as an Electricity Committee, to be making a profit out of the tramways. The progress of the electricity works in the three years had been exceedingly satisfactory. The total cost per unit sold for the first year, including all capital charges, was 4½d. In the second year, it was 3½d.; and this year it would come down to about 3d. Under these circumstances, the Committee felt they would not be justified in charging the Tramways Committee so high a rate for current as they had hitherto done. Mr. Page, a former Chairman of the Tramways Committee, had referred to this matter in a public speech, when he characterized the robbing of the Electricity Department to bolster up the trams as "gerrymandering worthy of the worst traditions of Tammany Hall." Alderman Radford strongly resented this attack, and denied the specific charge that they were producing electricity at a higher cost than any other municipality. Mr. Page declined to withdraw or modify his charges, and complained that the Electricity Committee did not produce, like the other Committees, a monthly statement of their progress. Last year, the expenditure of the Electricity Department exceeded the estimate by £2400. Yet they had no explanation or report from the Committee, who were piling up a heavy deficit. It was a fact that in October last year they were told that the cost of the current was 3d. per unit, and the charge to the Tramways Committee was then raised to this figure. To-day they were told that the cost was still 3d. Yet the tramways were only to pay 2½d. At Devonport, where the current is supplied by the Corporation to a Tramways Company, the cost had been fixed by arbitration at 1⅞d. per unit, and in many towns current for working tramways was supplied at from 1½d. to 2d. per unit. Alderman Radford, in his reply, said he was told that the Devonport electricity works were being run at a loss, which, at the figure quoted, was to be expected.

These discussions had a sequel in some interesting letters in the local papers. One was from Mr. H. B. Heath, the Secretary of the Plymouth and Stonehouse Gas Company. Dealing with the question of lighting back lanes, Mr. Heath explains that the Company have in every instance fulfilled their statutory duty of laying a service-pipe to every lamp within 50 yards of a main, with the result that a great number of the back lanes of the town are lighted. As regards the others he says:

When the Corporation decided to supply the electric light, they also asked us to come to some arrangement by which they would undertake the lighting and supervision of the public gas-lamps, which had previously been done by this Company. We met their wishes in every way—so much so, that they formally thanked my Directors for the friendly and conciliatory spirit in which they had been met. They further asked us to put them on a preferential footing as compared with the ordinary consumer, and allow them a special discount. While under no obligation to do this, my Directors again met them, and from that time have allowed the Corporation 5 per cent. discount. In the meantime, competition of the fiercest kind has been brought to bear by the Corporation against the Gas Company, as illustrated in Monday's proceedings, when it was announced that electric power, costing the Corporation 3d. per unit to produce, was to be supplied to the "Western Morning News" Company at 2½d. The loss upon this supply has to be made up from the rates, to which this Company contribute a very considerable amount; so that while our competitor takes away our business by supplying electric power at less than cost, we have to help make up the deficit. The Chairman of the Electric Light Committee stated that negotiations have been attempted with this Company with reference to the supplying of gas in back lanes beyond the 50 yards limit, but no result had come about, implying that the fault lay entirely with the Gas Company. The word "negotiations" is understood to mean an attempt on both sides to arrive at a bargain. My Directors have honestly made the attempt, but on each occasion have been rebuffed. We pointed out that the supplying of isolated public lights beyond the 50 yards limit would involve a considerable loss, but that we were prepared to meet the Corporation half way. We would open the road and lay the pipes at our own expense if the Corporation would forego charging us the cost of remaking the road. This would still leave a loss on the transaction; but my Directors were, and are, anxious to show a friendly spirit. Our offer was refused. We made another offer—namely, to adopt the same system as that of the Water Committee, who charge the consumer 10 per cent. on the outlay if the supply be required beyond the usual limit. This offer was also refused; the Electric Lighting Committee demanding that we should lay the mains and bear all the cost, irrespective of distance. When such unfair statements are made by Councillors as were made in the Council Chamber, I ask myself why it is that a man, who is perfectly honourable and fair-minded in his own business transactions, seems to think it his duty as a member of the Corporation to act unfairly by local companies and others when any matters affecting the interests of both are dealt with. Why were the Council not informed yesterday of the offers we had made to meet the wishes of the Electric Light Committee, instead of allowing it to be assumed that we had stood upon the strict letter of the Act of Parliament? I feel sure that the ratepayers, in whose interests the Councillors are assumed to be acting, have no desire for such unfair and unfriendly tactics to be adopted.

A second letter, from a ratepayer, calls attention to the fact that the Electricity Department and the Tramways have equally failed to justify the expectation that they would contribute to the relief of the rates. This writer draws unfavourable comparisons between the cost of producing electricity at Plymouth and in other towns, and derides the management of the undertaking for misleading the ratepayers as to the position and prospects of the concern.

GAS-WORKS IN THE MARKET.

It is not often that our columns contain an announcement of the sale of a gas-works, and still less frequently are there two of such intimations. It will, however, be seen, by an advertisement which appears elsewhere, that Mr. Alfred Richards will, on Tuesday, the 18th prox., invite biddings at the Mart, Tokenhouse Yard, E.C., for the freehold gas-works at Attleborough, Norfolk. They comprise a retort-house fitted with six retorts, a purifier-house with four purifiers, the usual auxiliary apparatus, and two holders, together with a manager's house. The distributing plant consists of upwards of 3000 yards of mains of various diameters, services, and meters, and there are 46 public lamps. The town has a population of 2100, only a few of whom now use gas, no attempt having been made by the late proprietors to extend the business by the introduction of modern methods. The works will be sold as a going concern, with possession on the 1st of January. The property comes into the market in consequence of the decease of the owners, whose estates are being wound up. The other gas-works for which offers are being invited, as announced last week, are those from which the town of Bottesford, near Nottingham is supplied. The business is smaller here than at Attleborough; the annual sale of gas being 610,000 cubic feet, compared with about 2 millions in the Norfolk town, which is a market one. The works stand on freehold land (included in the sale), and are well situated. It would seem that in each case there is room for development, and consequently scope for energetic management.

GAS APPLIANCES AT THE BREWERS' EXHIBITION.

The annual exhibition of machinery, appliances, and produce connected with the brewing and allied trades, which forms, for various reasons, one of the most attractive of the series organized by Messrs. Dale and Reynolds at the Agricultural Hall, Islington, only calls for notice in the "JOURNAL" to record the fact that certain enterprising firms of gas-stove makers avail themselves of this opportunity for bringing under the notice of the visitors the latest appliances by means of which gas can be utilized as a heating or as a cooking agent. During the week of the exhibition, which closed on Friday last, Messrs. S. Clark and Co., of Islington, had, as usual, a very fine show of gas heating-stoves in which a flue is dispensed with, as well as a varied collection of gas and oil bar stoves and mullers. The Davis Gas-Stove Company, Limited, had on view, in the portion of the gallery generally occupied by them, samples of their latest designs in cooking and heating stoves, grillers, hot-plates with patent automatic burners, and a number of specialities for hotels, restaurants, &c. Their exhibit also included washing-machines, water-heaters, and various appliances in which gas can be employed for industrial purposes. Another familiar stand was that of the Richmond Gas Stove and Meter Company, Limited, who of late years have secured a good position in the area of the hall. Their exhibits were specially suited to the requirements of the bulk of the visitors, comprising as they did all kinds of cooking apparatus for hotels, clubs, &c., special grillers, carving-tables and restaurant requirements generally. The collection of ordinary gas fires and stoves included the latest novelties introduced by the firm, which were fully described and illustrated in the "JOURNAL" last week (p. 1077). Not far from the Richmond Company's stand, which, it should be mentioned, was effectively lighted by incandescent gas-burners, was that of Messrs. Ritchie and Co., of Hatfield Street, Southwark, at which they displayed the various types of their well-known "Lux-Calor" condensing gas-stoves, of which they were the original patentees more than a quarter-of-a-century ago. Readers of the "JOURNAL" are aware that no flue is required with this stove, and consequently it is specially adapted for use in halls, ante-rooms, offices, conservatories, &c. Some of the samples shown were of a very ornate character, suitable for the drawing-room; and they all appeared to be doing excellent duty. Stoves on quite a different principle were to be found at the stand of the Eagle Range and Gas-Stove Company, Limited, who showed two of their "Premier" ranges and a grate in operation. The application of gas to purposes of hot water supply was exemplified at the stand of Messrs. Ewart and Son, Limited, of Euston Road, who showed their "Califont" and "Lightning" geysers, a bar boiler for giving an instantaneous supply of hot water, independent gas-radiators, and porcelain enamelled baths. It only remains to say that Messrs. Crossley Bros., Limited, had on view, as usual, various types of gas-engines; and that the Campbell Gas-Engine Company, Limited, showed a gas and an oil engine, each of 3 brake horse power.

COMBATING THE ELECTRIC LIGHT AT ELLAND.

Referring to the paragraph which appeared in our "Electric Lighting Notes" last week on the lighting by means of the "Elektra" incandescent gas-lamp of the Elland Town Hall, we learn that the hall was previously lighted with flat-flame burners grouped on large coronas. The Gas Company have simply turned the arms down, and screwed on the inverted incandescent gas-lamps. The consumption is just 3 cubic feet of gas per hour per burner, at 3 inches pressure; and although the Company do not get as high a duty out of the gas as some of the intensified incandescent gas-lights give, the effect is said to be splendid. Besides the lighting of the Town Hall, the Company have fitted up several places of worship, two mechanics' institutes, political clubs, and a grand display in several of the shops. In every possible way the Gas Company are preparing to fight the electric light installation which the Elland District Council are now pushing on with. They have placed in the consumers' hands the best incandescent burners, mantles, and fittings of every description, at net cost price; the result being that very few of them are without incandescent lights of the finest kind. Besides this, the whole district has been canvassed from time to time, and a large number of gas fires, cookers, &c., have been put out; the Company's last effort this season having been crowned with much success. A shop was opened for six weeks last June, and everything was exhibited which it was thought likely would "catch on" with the consumers. As a consequence, over 300 cookers have been put out, together with a large number of gas-fires and other fittings. The fires are let at 1s. a year, and, like the cookers, are fixed free. The District Council have evidently got some uphill work before them if they are to make their new venture pay its way; and seeing that the Gas Company originally offered to supply electricity in bulk at 2d. per unit (which offer was refused), the Council are hardly likely to receive much sympathy if they fail to attain this end.

SALES OF SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards, in conjunction with Mr. W. Ashmole, offered for sale, by order of the Directors, £5000 of ordinary "C" debenture stock of the Ilford Gas Company. It ranked for a standard dividend of 5 per cent., subject to the sliding-scale; the last dividend on the existing "C" stock having been 1 per cent. more than this. It was all placed at prices ranging from £116 to £119 per £100 of stock. On the same occasion, Mr. Richards sold, also under instructions from Directors, new issues of debenture and ordinary capital of the Lowestoft Water and Gas Company and the South Essex and Tendring Hundred Water Companies. The Lowestoft issue was 400 ordinary £10 shares, ranking for a maximum dividend of 7 per cent. (the last dividend on similar shares having been at the rate of 5¼ per cent.), and they fetched £11 and £11 5s. each; some 4 per cent. perpetual debenture stock of the Company being sold at £110 per cent. The new issue of the South Essex Water Company also consisted of 4 per cent. perpetual debenture stock, £2500 of which was sold at prices ranging from £110 10s. to £113. A new issue of "A" £10 shares in the Tendring Hundred Water Company, ranking for a maximum dividend of 8 per cent. (the last having been at the rate of 4½ per cent. per annum), was placed at par.——Mr. W. Harrold recently sold by auction twelve original ordinary £25 shares in the Frome Gas Company, bearing a maximum dividend of 10 per cent., at from £54 2s. 6d. to £55 7s. 6d. each, and three new 7 per cent. shares at £37 each.

TURIN GASLIGHT COMPANY.

The Annual Report and Balance-Sheet.

The following is a brief abstract of the report for the twelve months ending June 30 last of the Company which supplies the city of Turin with gas (Società Anonima dei Consumatori Gas-Luce), as presented to the meeting of the shareholders on the 30th of August.

The amount of gas sold during the twelve months was 432,512,726 cubic feet; being 3,421,525 cubic feet in excess of that sold in the preceding working year. This increase tends to show that the consumption, which had been diminishing for some years, has now touched its minimum and begun to rise again. The increase is to be attributed to a reduction in price, and to the fact that many consumers who had taken to the electric light have now reverted to gas. The total receipts from gas were 2,458,795·90 lire (£98,350); being 306,111·68 lire (£12,244) less than in the preceding year. This is accounted for by the price of gas having been reduced from 5s. 6d. to 4s. 6d., and finally to 4s. 3d. per 1000 cubic feet. The number of burners in use for public lighting on June 30, 1902, was 2319. This service represents a serious loss to the Company at all times; and in the past year it resulted in a loss of about £480 for the repair of damage done in the course of the strike referred to below. In the year under notice, 4355 yards of mains were laid, and connections were made with 1264 new consumers. During the twelve months the price paid for English gas coal varied from 22s. to 16s. 9d. per ton.

Notwithstanding the many ways in which the Company had cared for the well-being and comfort of the employees, in the hope that they would thereby be cured of the insane mania for striking, the counsels of irresponsible agitators prevailed, and matters culminated in the sudden desertion of almost all the workmen on the night of the 3rd of February. Despite the suddenness of the strike and the exceptional difficulties of the situation—for, owing to a large quantity of snow having fallen, street communications were interrupted—the Directors, with the assistance of the staff and the few workmen who had remained faithful, re-established the supply completely in a few days. The unaccounted-for gas amounted to 18·85 per cent. of the make, against 16·55 per cent. in the preceding year. The storage accommodation being insufficient, it is proposed to add a lift to one of the holders next year, and the following year to replace two of the old small holders by a large new one. After providing for a dividend of 5 per cent. on the share capital, there remains the sum of £135 to the credit of profit and loss account.

The Borrowing Powers of the Aberavon Town Council.—The Aberavon Town Council, as owners of the gas undertaking, are about to apply to the Local Government Board for a Provisional Order to extend their borrowing powers. These are now limited to £35,000; and it is proposed to ask for another £15,000. This will enable the Corporation to extend their mains to the neighbouring township of Cwmavon, to which district they have power to go, and also provide the necessary capital for the purchase of meters, cookers, &c. The Town Clerk has just received the sanction of the Local Government Board to the construction of the proposed new gas-works. The estimated cost is £11,307; and it is anticipated that the work will go forward at once, so as to meet the winter requirements of 1903.

POSITION OF THE GERMAN WELSBACH COMPANY.

Incandescent Gas Lighting and the Osmium Lamp.

In the course of an official communication addressed to the Teutonic newspapers, the German Incandescent (Welsbach) Gas-Light Company of Berlin have at last endeavoured to dispel the apprehensions which have been entertained in various quarters in regard to the position of the undertaking during the past financial year. Though the Company have no monopoly such as that existing in England, they paid, during the earlier years of their existence, dividends exceeding 100 per cent. But the annual distributions have gradually declined—the rate paid for 1900-1 being 28 per cent., against 33 per cent. in the previous year, on a share capital of £86,850. Since then, however, the capital has been increased to £120,000 by the acquisition of the patent rights for the osmium electric lamp; and upon this higher amount it is proposed to distribute for the past year a dividend at the rate of only 7 per cent. That the greater amount of capital participating in the dividend on the present occasion does not materially affect the rate of distribution is shown by the fact that, after providing for depreciation, the net profits only amount to £9240, compared with upwards of £27,600 in the preceding year. This heavy diminution is attributed by the Directors to the fact that, owing to depression, the Company's sales, especially in the case of burners, have declined, while at the same time it has been necessary to reduce prices. They, however, refrain from referring to the question of competition, which has now apparently broken the practical monopoly of earlier years.

The official communication, in alluding to the osmium electric lamp—for the patent rights of which the sum of £33,000 was paid, with the obligation to divide the proceeds with the Austrian Incandescent Gas-Light Company, who disposed of the patents to the German Company—sets forth that the improvements in the manufacture of the lamp have so far proceeded that it can now be placed on the market. No information is vouchsafed as to the capabilities of the new lamp; but it may interest many of our readers to learn that, according to the advertisements now being issued, the price has been fixed at 5s., of which 9d. will be refunded on the return of a worn-out lamp containing the osmium filaments—the lamp being of the double-filament type. It is claimed that it only consumes 1·5 watts per candle power, compared with 3·5 watts per candle in the case of the ordinary incandescent lamp having a carbon filament, or an economy of 56 per cent. It is further asserted that, on comparing thirty carbon filament lamps of 25-candle power alight for 900 hours—say, a year—with thirty osmium lamps of the same candle power for a like number of hours of lighting, the latter shows an economy of £36 both in regard to initial outlay and consumption of current. The price of the lamp appears, however, to be prohibitive of its general introduction, even if it could be supplied in sufficient quantities to meet the daily demand; while experience has yet to prove that the low-current consumption claimed for it can be realized in ordinary use.

SEWER VENTILATING SHAFTS AS LAMP-POSTS.

In reference to this subject, Mr. Norton H. Humphrys, F.C.S., Assoc.M.Inst.C.E., writes: "The Salisbury Town Council lately decided to erect a number of sewer ventilating shafts in various parts of the city, and applied to the Gas Company to know if they could be utilized as lamp-columns. They consist of a heavy cast-iron base or pedestal, carrying a steel tube about 6 inches internal diameter, and rising to a height of 20 to 25 feet from the ground. The scheme adopted has the advantage of being cheap and easily applied. It consists of curved arms made of 1-inch wrought-iron tube, relieved with a simple design in scroll-work; each arm being intended to carry a high-power suspension-lamp. There are two No. 4 Kern burners in each lamp; and one, two, or three arms are attached according to the position and surroundings of each post. A ring of 1-inch iron pipe is made to loosely fit on the shaft, and lapped on the upper side to receive the arms. These are secured to the shaft by iron cleats and set-pins, at such a height as to bring the lamps a clear 15 feet above the ground level. The ring is lapped on the under side to receive the gas supply, which consists of a piece of lead pipe carried in underground up the inside of the column, and brought out at a point just below the ring. There is no ladder-rest, as the cleaning and trimming are effected with the aid of a long pair of steps, as used by the Salisbury Gas Company in their maintenance department, which includes several burners fixed at an altitude of about 15 feet. The gas-burners are quite independent of the ventilating action of the shaft."

ELECTRIC LIGHTING IN BERMONDSEY.

Five Times the Cost of Gas.

The members of the Bermondsey Borough Council, at their meeting last Tuesday, were chiefly occupied with the discussion of matters connected with the lighting of the district. Upon the recommendation of the Electric Light Committee, it was resolved to apply to the Board of Trade for a Provisional Order authorizing the Council to supply electricity for public and private purposes in the Parishes of St. Olave and St. Thomas and St. John, which have been added to Bermondsey under the London Local Government Act. The Finance Committee reported having had under consideration an estimate of £4185 for the extension of arc lighting to nine streets. The annual charge for each arc lamp will be £20; and as the number of lamps to be erected will be 55 of 1200-candle power each, and two incandescent lights of 32-candle power each, the total annual charge will be £1100. The number of gas-lamps displaced will be 82 ordinary flat-flame burners, each of about 14-candle power, ten incandescent burners of 60-candle power each, and six No. 4 Kern burners of 80 to 100 candle power each, the annual charge for which is £267 19s. The Committee recommended that the estimate of £4185 should be made a charge on the capital (works) account. Mr. Layman said the annual charge for arc lighting and repayment of the loan and interest would bring the cost up to £1237 8s. 10d. a year, which was five times as much as they were now paying for gas. What would the ratepayers say to this? When the fact became known, and the local papers, and the organs of the gas industry saw it, there would be meetings of protest, and the Council would have to face an agitation from ratepayers' associations and labour organizations. Mr. Fells remarked that an enormous amount of money had been spent on introducing the electric light into Bermondsey, and it was useless drawing back now. The recommendation was adopted. The same Committee reported having had under consideration an estimate of £1190 for the substitution of electric light for gas in 13 side streets. The number of gas-standards proposed to be converted is 96, of which 81 are the ordinary flat-flame burners, 12 No. 4 Kern burners, and three No. 2 Kern burners each. It is proposed to substitute for each gas-lamp two electric lamps, each of nominally 16-candle power; but in consequence of the silver backing it is intended to use, the power is intensified, the Committee state, to the extent of 140 candles. The cost of the new lighting will be £384 a year (96 incandescent electric lamps at £4). The present cost of gas is £263 2s. 10½d. The Committee recommended that the estimate of £1190 be made a charge on the capital (works) account; and this was agreed to.

GAS AND ELECTRICITY IN MANCHESTER.

Street Lighting Experiments.

Dr. Bishop, the Chairman of the Electricity Committee of the Manchester City Council, when addressing a meeting of the electors last Wednesday, took advantage of the opportunity to refer at length to the recent criticisms of the undertaking. After alluding to the question of the letting of contracts to foreign firms, he remarked that the Committee had been charged with having spent £35,000 in experimenting on street lighting. First of all, no experiment was being made; and the Committee had not spent £35,000. As far back as October, 1897, the Council commanded the Electricity Committee to light no fewer than 22 streets with electricity. The command was not obeyed, simply because there was at that time too much talk about electricity, and too little done. They could not light the streets and run the cars as well; and the latter were considered to be the more important. But recently, when the Committee wanted to carry out the orders given five years ago, Alderman Gibson, the Chairman of the Gas Committee, produced a lot of figures proving everything that was good about the Gas Committee and damnatory to the Electricity Committee. The result was that the last-named Committee were told not to go on. What was to be made of the City Council, if they were going to turn round like that? He admitted that the present system of incandescent gas lighting was very good. Alderman Gibson told them to go to the Technical School and look at the streets round there, and then to look at Piccadilly. But Piccadilly was not a grand experiment. He would say, however, in regard to Whitworth Street, that he called it "the drunken man's paradise," because one had only to go two paces to find a post to which to cling. If they would give him the chance of putting up the same number of posts for arc lighting, he would "knock spots off it." Talking to some men in the City Council made him absolutely tired. Electric lighting was only a child in arms compared with gas lighting. It was, however, already making rapid strides; and it would not be very long before gas lighting was knocked out. This was no vain boast. He had in his house a little electric globe which was equal to about half-a-dozen of the ordinary ones, and consumed only half the current. This was the latest development in electric lighting, and could not yet be bought. With regard to the Corporation's existing agreement with the out-districts to supply them with electric current, Dr. Bishop said that ever since he was elected to the Electricity Committee he had been trying to show that this was a bad bargain. None of the agreements would last for less than 15 years, and most of them would last for 21 years. The districts all had power to generate their own electricity; but ex-Alderman Higginbottom conceived a gigantic scheme for supplying the whole of these districts, saying it would be a good thing for Manchester and a good thing for the out-districts. As it had turned out it was a good thing for the out-districts, but an extremely poor thing for Manchester, as very few people in the districts required electric light, and very few wanted electricity for power. In the whole of Denton there were only three users of electric light; but a small sub-station costing thousands of pounds had had to be built. So it went on all round Manchester; and he prophesied that not one of the agreements in ten years would pay Manchester a single farthing.

Water-Works Arbitration at Yeovil.—Arbitration proceedings recently took place to decide the amount of compensation to be paid by the Yeovil Corporation to the Earl of Ilchester in respect of certain water-rights over his Lordship's Melbury estate; and the award of the Umpire (Mr. E. P. Squarey) was submitted to a special meeting of the Town Council last Saturday week. The Earl of Ilchester claimed £19,151, the Corporation offered £2204, and the Umpire awards £4907. In addition, the Corporation have to pay the whole of the expenses connected with the arbitration. The award was favourably received by the Council; the ex-Mayor remarking that they had come off better than they had anticipated. As the water supply of the borough is at present in a perilous state of insufficiency, it was decided to immediately take steps to connect the reservoirs with the newly-acquired springs.

METROPOLIS WATER SUPPLY.

The Progress of the Intercommunication Scheme.

As already mentioned in the "JOURNAL," the last annual report of the Local Government Board contains, as usual, the report of the Official Water Examiner (Mr. Charles Perrin, M.Inst.C.E.) on the work of his department. In the course thereof, he continues his account of the progress of the scheme of intercommunication which, as our readers are aware, is being carried out by the London Water Companies. The work is of sufficient importance to justify the reproduction of Mr. Perrin's story of its inception and execution.

The Local Government Board have for some years past recognized the special need for arrangements being made by which any one of the Metropolitan Water Companies may be enabled, in case of failure of supply from drought or other cause, to derive temporary assistance from one or more of the other Companies. The necessity for such means of interchange of water was brought very prominently to notice in 1895 to 1896, and again in 1898 and 1899, when the East London Company, owing to the inadequacy of their storage reservoirs, were unable to deliver, from their own sources of supply, sufficient water to meet the requirements of their district.

During the summer of 1895, an interruption in the constant supply to the East London district took place, which culminated on the 15th of July in the shutting off of the water supply of the whole district, containing a population of 1,200,000, during 21 hours out of every 24; the gravitation store of water in the reservoirs having been reduced to a quantity representing half-a-day's supply, in consequence of the abstraction of water therefrom at an average rate of 12 million gallons a day over a period 47 days. The hours of supply were shortly afterwards extended; but the constant supply was not fully restored until the 8th of October following.

The drought which prevailed in the basin of the Lea during the five months from April to August, 1896, seriously reduced the flow in that river; and the reservoirs of the East London Company were rapidly depleted. The Company were in consequence, on the 17th of July, compelled to revert to the intermittent system, and constant supply was not completely restored until the 19th of September.

In 1898, the reservoirs of the East London Company were full on the 20th of June, and contained 1200 million gallons. On the 22nd of August, the store was reduced to 308 million gallons; and on that day the Directors restricted the daily supply, which had previously been constant, to two periods of three hours each. The supply was continued in this manner until the 3rd of September, when a further restriction was enforced by which the daily supply was limited to two periods of two hours each. No further change occurred until the Directors announced that from the 23rd of November the supply would be continued from the commencement of the first period in the day to the close of the second period without intermission. A constant supply was restored in a portion of the district of the Company on the 7th of December, and wholly resumed on the 14th.

The serious state of affairs foreshadowed at the commencement of the drought engaged the earnest attention of the Board, who entered into correspondence with the East London and other Metropolitan Companies on the subject, with a view to such arrangements being made as might enable the first-named Company to meet their liabilities as to supply. The result of the negotiations was that works were undertaken by means of which the East London Company received aid directly from the New River, the Southwark and Vauxhall, and the Kent Companies. The first allowed water which it was entitled to abstract to pass down the Lea; the second pumped water under the Thames, through the Tower Subway, into the riverside district of the East London Company; and the third passed water into the East London Limehouse district, through the Blackwall Tunnel, by permission of the London County Council. The Grand Junction and West Middlesex Companies supplied water to the New River Company, which was thus enabled to increase its supply to East London. During the five months, July to November, the East London Company received from the New River, Southwark and Vauxhall, and Kent Companies 1,158,010,000 gallons of water; but it may nevertheless be assumed that during this period the supply was short of the demand to the extent of from 700 to 750 million gallons.

Before the summer of 1899 set in, additional connections between the mains of the different Companies had been effected; and the East London Company were able at all times, by the aid of other Companies, to fully meet the requirements of their district without restricting the hours of supply. The total amount contributed by other Companies between July and November was 1,898,846,000 gallons. The New River Company were recouped for the water passed on to the East London Company by the Grand Junction Company to the extent of 306,328,000 gallons, and by the West Middlesex Company of 30,952,000 gallons.

When the Royal Commission over which Lord Llandaff presided was appointed, the Commissioners were requested by the President of the Local Government Board to deal as speedily as possible with the important question of interconnection. Much evidence was taken on this question, and, after considering the various proposals laid before them, the Commissioners reported that the schemes submitted illustrated the fact that it was practicable to connect the whole of the systems of supply administered by the eight Water Companies.

On the 6th of June, 1899, the Metropolis Water Act, 1899, received the Royal Assent, by which the Local Government Board were authorized to call upon the Companies to submit schemes for works enabling the Companies to supply each other with water from any sources of supply which any Company are for the time being empowered to use, and to construct such works as may in the opinion of the Board be necessary for that purpose; and whenever in the opinion of the Board a case of emergency has arisen, or is likely to arise, to supply at a reasonable cost, and to such extent and during such period as the Board may direct, such water as may be required for the need of another Metropolitan Company and may be available after satisfying the requirements of the district of the supplying Company.

Between the 1st of September, 1898, and the 31st of December, 1899, about £160,000 was expended on works of intercommunication. These works were confined to the provision of means for passing spare water from the Southwark and Vauxhall and Kent Companies direct into the East London district, and for recouping the New River Company in part for the water allowed by them to pass their intake on the Lea for the benefit of the East London Company.

A general scheme of intercommunication, by which each Company can be largely assisted by one or more Companies in case of emergency, has, at the instance of the Local Government Board, been prepared by the Associated Water Companies. This scheme has, after inquiry, been approved, and orders for the execution of the necessary works have been issued by the Board to the Companies concerned.

The following works of intercommunication have been carried out by the Water Companies for the assistance of the East London Company:—

The first connection made by the Grand Junction Company was carried out in September, 1898, and consisted in laying a main to join the Company's 30-inch high-pressure main from the Campden Hill works to the 24-inch main connecting the 36-inch East London Hanworth main with the Grand Junction Company's reservoir at Campden Hill. This connection enables the Company to pump water through the East London Hanworth main to the East London reservoir at Finsbury Park, should any accident occur to the Hanworth main west of Campden Hill.

A second connection was made, at the urgent request of the Board, joining the Company's No. 1 30-inch main in Oxford Street, near Poland Street, with a 24-inch main which the New River Company laid from the corner of Tottenham Court Road to the boundary between the districts of the New River and Grand Junction Companies.

The third work of interconnection undertaken by the Company, in compliance with the wish of the President of the Local Government Board, was the laying of a main from the Company's works at Kew to their reservoir at Campden Hill, and thence to Poland Street. This main is 24 inches in diameter from Kew Bridge to King Street, Hammersmith, where it becomes a 30-inch main, and is joined by an 18-inch main from the West Middlesex works at Hammersmith. The 30 inch main is continued to Ladbroke Road, whence two 24-inch mains run into, and out of, the Company's Campden Hill works. Beyond this point, the main is continued as a 24-inch main to Poland Street, opposite which it joins the New River Company's 24 inch main, running direct to the New River Head.

The New River Company have laid, for purposes of intercommunication: (1) A 24-inch main, with all necessary valves and connections, from Gray's Inn Road, by the Holborn Town Hall, to a junction with the 24-inch main of the Grand Junction Company at Oxford Street. (2) A relief main, 16 inches in diameter, from Farringdon Road, by Mount Pleasant, to Gray's Inn Road. (3) A 24-inch main from the Company's 24-inch main in Rosoman Street to the New River Company's settling reservoir at New River Head.

In 1898, the West Middlesex Company made a connection between their 21-inch main in Oxford Street and the New River Company's main in Berners Street. In 1899, the Company laid an 18-inch main from their works at Hammersmith to join the 30-inch main laid by the Grand Junction Company from Kew to Campden Hill at King Street, Hammersmith. A connection was also made at Ladbroke Road between the West Middlesex 30-inch main and the new 30-inch main laid by the Grand Junction Company.

A line of 24-inch main was laid by the Kent Company from their Deptford pumping-station to the point in Queen's Road, Peckham, where the 36-inch intercommunication main of the Southwark and Vauxhall Company crosses that road.

The first connection from the Southwark and Vauxhall Company's system to the East London Company was made by means of a 20-inch main from the corner of Bermondsey Street, along Tooley and Vine Streets, to the Tower Subway, where it was connected to a 20-inch main of the East London Company. This main was commenced on the 2nd of September, 1898, and completed on the 18th of the same month. In order to provide the supply required, it was also necessary to erect at Nunhead additional pumping plant. This consisted of two portable boilers and a three-cylinder pumping-engine. On the 22nd of December, 1898, an agreement was made between the Southwark and Vauxhall and the East London Companies for the laying of a 24-inch main from the former Company's reservoirs at Nunhead to the Tower Subway. This was commenced on the 1st of February, 1899, and finished on the 10th of July of that year. At the corner of Queen's Road, a 24-inch connection has been made with the 24-inch main of the Kent Company, and at Tooley Street with the existing main of the Southwark and Vauxhall Company.

To enable the water passed on by the Southwark and Vauxhall and the Kent Companies to be distributed in their district, the East London Company laid mains from the Tower Subway to Commercial Road and from the Tower Subway to Whitechapel.

The following connections between the mains of the several Companies also exist: The unfiltered-water mains of the Grand Junction Company have been connected with those of the West Middlesex and Southwark and Vauxhall Companies at Hampton and the Thames supply main of the East London Company at Isleworth, and there are branch mains from the same main of the East London Company into the Kew Bridge and Campden Hill reservoirs of the Grand Junction Company. Again, there are connections between the Grand Junction main and that of the West Middlesex Company at the Marble Arch, and between the mains of the former Company and that of the East London Company in the Bayswater and Grand Junction Roads. The Chelsea Company have connected their mains with those of the Grand Junction Company near St. George's Hospital, Hyde Park Corner. The New River Company connect with the West Middlesex Company in New Oxford Street by Tottenham Court Road, and at Euston Road by Tottenham Court Road. There is no connection between the Southwark and Vauxhall Company and the Lambeth Company, so that they cannot assist each other in the event of accident.

The East London Company's mains are connected with those of the

Tottenham Urban District Council. The East London Company can pump water into the New River channel, and the New River Company can supplement the East London supply by abstracting less water from the Lea, and allowing the surplus to pass down to the East London intake.

The Chelsea Company are engaged in laying a 30-inch main from Caledonia Street, Pimlico, to the Bell and Horns public-house in the Brompton Road—a distance of about 4030 yards; the New River Company have laid a 30-inch main from the New River Head to Caledonia Street, Westminster, where it will be connected with the mains of the Chelsea, West Middlesex, and Grand Junction Companies; and the Southwark and Vauxhall Company have entered into contracts for constructing about 13 miles of 36-inch main, and two tunnels under the River Thames.

LIVERPOOL CORPORATION WATER SUPPLY.

The Past Year's Work.

The Water Committee of the Liverpool Corporation held their final meeting for the present municipal year on Tuesday last—Alderman W. J. BURGESS in the chair.

A report from the Water Engineer (Mr. J. Parry, M.Inst.C.E.), on he quantity of water supplied during the preceding week, having been received,

Alderman GRINDLEY moved a vote of thanks to Alderman Burgess for his services as Chairman during the year. He referred to his able management of the Committee's affairs, and spoke in especially warm terms of the manner in which he had conducted the parliamentary business relating to the water supply embodied in the recent Bill.

Captain DENTON seconded the motion, and it was passed.

Alderman BURGESS, in responding, reviewed the position of the undertaking, and expressed his pleasure at being able to state that it continued to be in every way satisfactory. The number of water tenants in Liverpool and the suburbs was now 173,210, or 2210 more than in the year 1901. The total population in this area was approximately 854,000, and, including the borough of Chorley, with 27,350, and about 150,000 persons who were supplied from the Liverpool works in bulk along the Rivington aqueduct, the Corporation were responsible for giving water to a population amounting in the aggregate to considerably over a million. The total quantity of water supplied from the Liverpool works during the year had been 10,387,584,000 gallons—an increase of 422,782,000 gallons compared with the quantity supplied in the previous twelve months—more than a million gallons increase daily, which was double that which he indicated as likely to be the average when asking the City Council to sanction a second line of pipes from Lake Vyrnwy. They might remember that last year it was his duty to mention a slight falling off in the demand for trade and manufacturing purposes, but that he expressed a hope that this circumstance was due to temporary causes, which were even then disappearing. He was glad to say that the hopeful prediction then made had been verified, and that there had been an increase of 92,163,000 gallons in the trade consumption; the quantity thus used having amounted to 2,397,184,000 gallons. The demand for shipping also showed a gratifying increase of 11,877,100 gallons; and his colleagues would agree with him that these statistics indicated very forcibly the progress and prosperity of the city and the port. The quantity of water sold in bulk by meters along the Rivington and Vyrnwy aqueducts had been 542,596,000 gallons, or 48,455,000 gallons more than in the previous year. There had thus been a substantially progressive movement in the consumption of water; and he was glad to say they had been at all times able to give a constant service throughout the whole area of supply. During the year about 10 miles of new mains had been laid in and around the city, and renewals had taken place wherever, in the opinion of the Engineer, they had been required. The Cowny tunnel had been completed, and considerable progress had been made with the masonry dam across the river, and other works needful to intercept the water and convey it to Lake Vyrnwy. Some progress had also been made with the Marchnant tunnel, which had been commenced during the year; but the hardness of the rock at the inlet end had hitherto rendered the progress somewhat slow. The filtering arrangements for Chorley, which were sanctioned by the Committee in 1900, had been completed, and further works for the improvement of the Chorley supply were now under consideration. Substantial progress had been made in constructing the new reservoir at Prescot. Some difficulties experienced in reaching satisfactory foundations at two or three points in the course of the trench had been overcome by carrying those lengths of foundation down to a greater depth than originally intended. They might reasonably expect that this important work, which would increase their storage accommodation by upwards of 100 million gallons, would speedily be completed. The consent of the Local Government Board to the execution of the works needed for the supply to Wallasey was obtained in October, 1901, and in January last a contract for the laying of the pipes was signed by Messrs. Holme and King—the pipes, 21 inches in diameter, being obtained from Glasgow. The length of this line of pipes would be about 31 miles. Some 14 miles had been laid, and the Contractors, both for the manufacture and laying of the pipes, were being urged to proceed as rapidly as possible. The Committee, having carefully considered the extent of the resources at their disposal, and the probable future requirements for water, recommended the Council in the spring of the present year to sanction a second pipeline, which would entail an expenditure probably of at least £800,000. The City Council unanimously approved of the proposal, and a contract for the supply of the cast-iron pipes required for completing the first section of the work from Norton to Prescot was signed in May, and a further contract for laying the pipes was signed in July; and during the latter month this work was commenced. The total length of pipes laid up to the end of the preceding week was 1662 yards. This rate of

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1136.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	19—20*	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	12½—13½*	..	5 11 1
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	May 14	6½	Bombay, Ltd. . . .	6—6¼	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4¾	..	5 9 5
380,000	Stk.	Aug. 14	12	Brentford Consolidated	249—254	..	4 14 6
270,000	,,	,,	9	Do. New . . .	182—187	..	4 16 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 17	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2
220,000	Stk.	Sept. 11	10	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7	Do. A. Ord. Stk. .	152—157	..	4 18 9
460,000	20	Sept. 26	10	British.	39½—40½	+½	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c. .	22—24	..	5 0 0
82,850	10	,,	9	Do. 7 p.c. . . .	18—20	..	4 10 0
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10—10½*	..	6 13 4
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 11	8½	Cagliari, Ltd. . . .	21—23	..	7 3 6
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	260—265*	..	4 14 4
251,875	,,	,,	9½	Do. New do. .	200—205*	..	4 12 8
271,875	,,	June 12	4½	Do. 4½ p.c. Deb.	130—134	..	3 7 2
800,000	Stk.	May 28	9	Continental Union, Ltd.	138—143	..	6 5 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Aug. 28	5½	Crystal Palace Ord. 5 p.c.	118—123	..	4 6 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5
486,090	10	July 30	10½	European, Ltd. . . .	17¾—18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Aug. 14	4	Gas-light and Coke	4 p.c. Ord. . .	89—91	..	4 7 11
2,600,000	,,	,,	3½		3½ p.c. max. .	89—91	+1	3 16 11
3,799,735	,,	,,	4		4 p.c. Con. Pref.	108—110	+1	3 12 9
4,193,975	,,	June 12	3		3 p.c. Con. Deb.	92—94	..	3 3 10
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	14¾—15¾	..	5 3 3
3,800,000	Stk.	May 14	10	Imperial Continental .	205—207	..	4 16 7
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	99—101	+1	3 9 4
561,000	Stk.	Aug. 28	10	Liverpool United A	227—229	..	4 7 4
718,100	,,	,,	7	Do. do. B .	165—167	..	4 3 10
306,083	,,	June 24	4	Do. do. Deb. Stk.	116—118	..	3 7 10
75,000	5	June 12	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of ⎫ 5 p.c. Deb.	104—108	..	4 12 7
250,000	100	,,	4½	Melbourne ⎭ 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	June 12	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
1,515,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.	104½—105½	+½	4 5 4
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.	99—100	..	3 10 0
300,000	Stk.	—	8	Oriental, Ltd. . . .	—	..	—
00,000	5	Sept. 26	7	Ottoman, Ltd. . . .	6½—7	+⅛	5 0 0
					* Ex div.		

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Oct. 15	7	River Plate Ord. . .	9¾—10¾*	..	6 16 7
300,000	Stk.	June 24	4	Do. 4 p.c. Deb..	93—96	..	4 3 4
250,000	10	Sept. 26	8	San Paulo, Ltd.. . .	11⅛—12⅛	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	236—238	..	4 4 0
523,498	,,	,,	10	Do. C	235—237	—1	4 4 5
6,000,000	Stk.	Aug. 14	5⅓	South Met., 4 p.c. Ord.	122—124	..	4 6 0
1,700,000	,,	July 11	3	Do. 3 p.c. Deb. . .	91—93	..	3 4 6
380,940	Stk.	May 14	5	Southampton Ord. . .	102—106	..	4 11 4
87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton ⎫ A. 5 p.c. ⎭ B. 3½ p.c.	118—123	..	4 17 7
300,520	,,	,,	4½		93—98	..	4 11 10
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	7—8	..	6 5 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
230,000	5	Aug. 14	9½	West Ham, 10 p.c. . .	10—11	..	4 6 4
172,000	10	,,	6½	Do. 7 p.c. . .	13½—14¼	..	4 9 8
				WATER COMPANIES.			
780,599	Stk.	June 24	11⅓	Chelsea, Ord. . .	300—310	..	3 14 2
150,000	,,	,,	5	Do. 5 p.c. Pref. .	152—157	..	3 3 8
160,000	,,	,,	4⅔	Do. 4⅔ p.c. Pref. '75	140—143	..	3 2 11
175,785	,,	Sept. 26	4⅔	Do. 4⅔ p.c. Deb. .	137—142	..	3 3 5
1,720,560	Stk.	Oct. 15	8	East London, Ord.. .	211—216*	..	3 14 1
654,740	,,	June 12	4⅔	Do. 4⅔ p.c. Deb. .	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
700,000	50		8	Grand Junction ⎫ 10 p.c. max.. ⎭ 4 p.c. Deb..	110—115	..	3 9 7
310,000	Stk.	Sept. 26	4		125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	285—295	..	4 14 11
160,000	,,	,,	7	Do. New, 7 p.c. max..	195—205	..	3 8 4
1,043,800	100	June 24	11	Lambeth, 10 p.c. max..	290—300	..	3 13 4
406,200	100	,,	8⅓	Do. 7⅓ p.c. max..	210—220	..	3 17 3
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 14	12 5/16	New River, New Shares	385—395	..	3 4 9
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	June 12	7	Southwark and Vauxhall ⎫ Ord. . . . ⎭ 7⅓ p.c. max. ⎭ 5 p.c. Pref..	195—200	..	3 10 0
126,500	100	,,	7		180—185	..	3 15 8
489,200	Stk.	,,	5		152—157	..	3 3 8
1,019,585	,,	Oct. 15	4		123—128*	..	3 2 6
1,155,066	Stk.	June 12	10	West Middlesex. . .	270—280	..	3 11 5
200,000	,,	,,	4⅔	Do. 4⅔ p.c. Deb. .	139—144	..	3 2 6
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10
					* Ex div.		

progress was, to his mind, altogether too slow; and the first duty of the new Committee would be to consider the advisability of commencing further sections of the work, in order that the line might be ready when the water was needed. The rapid increase in the consumption during a year of which the climatic conditions had not been specially conducive to an abnormal demand, indicated very clearly the need for energy in pushing forward the work. In the meantime, the Contractors were being urged to proceed with the first section more rapidly. Alderman Burgess next alluded to the questions relating to the water undertaking which had formed the subject of a prolonged parliamentary inquiry during the year. One of comparatively minor importance was the clause inserted in the Corporation Bill, on the advice of those who were best qualified to form an opinion—a proposal made in the interests of all who depended on the Committee for water—that Liverpool should be placed in the same position with regard to supply to high elevations as that almost universally occupied by other water authorities giving a gravitation supply. The question was purely an economical one; but Parliament declined to pass the clause, which would have been advantageous to 990 out of every 1000 consumers of water in the area of supply. He believed those who opposed them mistakenly—doubtless with the best intentions—and whose apprehensions they were unable to allay, would eventually come round to the view that the proposal was both fair and reasonable. On the more important subject of the desirability of purchasing the portions of the Rivington watershed which did not at present belong to the Corporation, they were able to convince the Committee of Parliament that, in the interests of the purity of their water supply, they ought to own the gathering-ground. He did not pretend to understand how the extraordinary decision was arrived at that, while the Corporation ought to own the land, there was no harm in permitting a park, which might be regularly frequented by thousands of people, on the margin of their largest reservoir. No one would dream of constructing a reservoir at the foot of a park designed for the use of a large population; and he saw no reason why they should not be protected against a park being placed on a reservoir on which more than a million people depended for drinking water. A great and satisfactory change had come over public opinion regarding the necessity of maintaining the purity of drinking water since the Committee's predecessors thought they had fulfilled their duty without acquiring the gathering-grounds from which they derived their supplies; but he thought the decision in this case showed that the education of Parliament on this subject had not yet been completed. They had to accept the decision, and to make the best of it; but he sincerely trusted that in future it might be found that greater importance would be attached to the prevention of pollution on the gathering-grounds which supplied huge populations with water, upon the purity of which the health and comfort of the people so largely depended. Alderman Burgess added that the past year had been one of strain and stress for those who were responsible for the water supply of Liverpool, and for the next two or three years they must look forward to hard work on the Committee. The installation of the supply to Wallasey, the completion of the works at Cowny and Marchnant and the reservoir at Prescot, and the construction of the second pipe-line from Vyrnwy, constituted a programme sufficiently large to appease the appetite of any Committee, however greedy for work it might be. It was their good fortune to have in charge of the undertaking most capable and diligent officials. The Chief Engineer was able, devoted, and zealous, and was always ready to give them that information which they ought to have, and must have, if they were to fulfil their obligations.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I think it may be taken for granted that few decisions of Corporations have been of so much interest to gas managers as is the refusal of the Greenock Town Council last Tuesday, by 16 votes to 6, to grant a pension to Mr. S. Stewart, their late Gas Engineer and Manager. Mr. Stewart served the Corporation for 35 years, was a highly trusted servant, and very successful. As is well known, he was the Engineer who carried through the erection of the new gas-works at Inchgreen—a very large scheme, which was successfully worked until the sugar trade of the town sustained the set-back which affected industry all round in Greenock. Till this happened, the Corporation were able to draw surpluses from profits made by the gas undertaking, and to apply them to the relief of other departments. I do not know that there need be much regret that this decision has been come to in Mr. Stewart's instance, unless it be that he should be the first to be made, as it were, an example of. We cannot look at the course of events in all walks of life in recent years without perceiving that the tendency has been distinctly in favour of direct payments alone, leaving out allowances for free house, and indeed all perquisites, including pensions. One of the reasons for this change of feeling has undoubtedly been the growing influence of labour members in municipalities, the representatives of which class are all against the granting of large salaries, or any pecuniary considerations of a liberal nature, to public officials. The incident is a fingerpost which should not be mistaken. Unless the pendulum should swing back, which is unlikely, managers of corporation gas-works who are being appointed now need have little hope of getting a pension when they come to the end of their active career. Old-age pensions for workpeople are an aspiration of to-day; and it may be taken for granted that town councillors with socialistic leanings will not favour the granting of better conditions to the higher classes of employees than they can secure for the lower classes.

The Gas Committee of the Aberdeen Town Council have resolved to recommend that all men employed in the works between 6 a.m.

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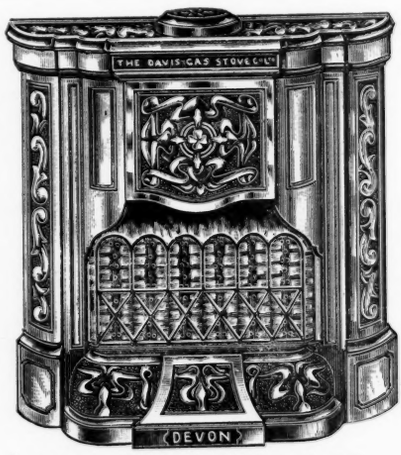

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and 6 p.m. on Sundays be paid at the rate of time-and-a-quarter. This resolution has been come to on the representation of the men to the effect that there is a measure of unfairness to men called in to take the place of men of the shift who do not turn up on Sundays. There was a proposal that the rate should be time-and-a-half; but this was not carried. The Committee, in coming to their decision, were influenced by the example of the Glasgow Corporation.

Mr. A. Yuill, who holds his appointment at Alloa till the end of this month, was in Dundee on Tuesday, at a meeting of the Corporation Gas Committee there, and submitted a report upon the subject of the enrichment of coal gas by benzol. Hitherto in Dundee only coal has been used for the making of gas. Mr. Yuill gave a number of figures relative to the results to be obtained by the use of benzol, and explained that in gas stoves, engines, and other appliances, the necessity for having a gas of high illuminating power is not so great as it formerly was; but that, on the other hand, the public insist upon getting a gas that is suitable for all ordinary purposes, including that of lighting. With benzol a greater uniformity in the quality of the coal used is possible, and the resulting coke does not suffer by admixture with coke from inferior coal. A cheaper class of coal may be employed; and he calculated that the saving upon the quantity of coal which had been estimated for the year would be about £3816. It would be possible also to increase the illuminating power of the gas by 3 candles. He recommended the Committee to obtain a carburettor, at a cost of about £563. The apparatus could be easily fitted up, and used without delay. The Committee were favourably impressed with the proposal, and agreed to recommend the Council to provide a carburettor. They also resolved to have Mr. Yuill's report printed and circulated among the members of the Council. Mr. Yuill has thus set to work at Dundee before his removal to the city.

Following upon this statement, there comes appropriately the other one that the Town Council of Alloa held a special meeting last night, to hear the report of a Committee who had prepared a short leet out of the applicants for the post of Gas Manager. Five gentlemen are to be asked to attend a meeting of the Council next week. There is to be no delay in the filling up of this appointment.

The Directors of the Oil-Gas Enrichment Company report that their business progressed satisfactorily during the past year. The Young and Glover process for preventing deposits of naphthalene is now in operation in three, and is in course of erection in other three, gas-works in England. Reliable data as to the practicability of the process should therefore be soon forthcoming.

The afternoon of Tuesday last was an awkward time for the Dundee Corporation Electricity Department. The current fluctuated greatly, to the great inconvenience both of those who employ it for power purposes and those who use it for lighting. Apparently, concurrently with this state of matters, there were three explosions of gas in the electric cable conduits, and several manhole covers were blown off. Mr. Tittensor, the Electrical Engineer, explains that, on account of fire having been caused by a spark—not an unusual thing—while a workman was engaged in joining a cable, and of the cable being damaged, it was necessary to cut off the western circuit.

It seems, indeed, that, so far as he is concerned, the end of the difference of opinion between Mr. T. Mitchell, of Greenock, and myself, regarding the gas affairs of that town, is very far off. But why? Because he will not be satisfied with the explanations given. He began by saying that many of my remarks were "totally misleading," and some of them "absolutely untrue." In his second letter, he used the unpleasant expression of "old game," and innuendoed "an impartial correspondent;" and again, in his last letter, he writes of "mystifying tactics." So far from endeavouring to mystify, I have all along sought to clear up matters; but I have never used offensive expressions regarding Mr. Mitchell or his policy. He puts, dogmatically, five cardinal points to me, and then says he wants my authority for them. This is a new request by him; and it is one which, when made, journalists are not in the habit of complying with. If it would gratify him, however, I may tell him that the information is all to be found in Greenock. It is common property in the Gas Committee there. He will find that the estimated yield of gas in the year 1901 02 was 9600 cubic feet per ton; that hand stoking produced 10,215 cubic feet per ton; that the coal used was less and the yield of gas more, as stated; and if he makes inquiry in the proper quarter, he will learn about the fuel which was consumed in the marine boiler. As to the purchase of the boiler, I showed in the "JOURNAL" for September 16 that when attacked for his having purchased it he sought to justify his action. It is not my duty, nor interest, nor desire, nor am I in a position, to make any reflection upon the equipment of the Greenock Gas-Works, except so far as the results are affected by it; but if the results are affected by the plant, it is right that this should be acknowledged. These results, and their causes, are more fully known to the members of the Greenock Corporation than they are to me; and, as I wrote before, any questions relative to the operations at the gas-works can be dealt with by Mr. Mitchell among his colleagues. When he convinces them that his views are right, I will acknowledge that I have been in error. Until then, I must abide by the information which I have received.

Water Supply of Ripponden and Soyland.—The new water-works which have been provided for Ripponden, Soyland Town, Mill Bank, &c., by the Soyland District Council, have now been formally opened. The scheme was undertaken in the spring of 1899, in consequence of the unsatisfactory and uncertain nature of the springs and wells on which the district formerly relied. As a result of the steps then taken, a plentiful supply of good water was found at Black House Farm, and subsequently neighbouring land was purchased. At the beginning of 1900, the work of laying the mains, &c., was entered upon; the total cost of the scheme being about £17,500. A reservoir has been constructed with a capacity of nearly 7 million gallons. The work has been carried out from plans by, and under the superintendence of, Messrs. Richard Horsfall and Son, of Halifax.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 25.

Sulphate of Ammonia.

Prices have been somewhat irregular; but on the whole they have barely been maintained, the closing quotations being £11 12s. 6d. per ton f.o.b. Hull, £11 13s. 9d. per ton f.o.b. Leith, and £11 15s. to £11s. 16s. 3d. per ton f.o.b. Liverpool. There has again been a fair amount of purchasing, but principally by dealers to cover October sales. This operation having been about completed, the market closes with a quiet tone. Consumers have been for the most part interested in November-December delivery, which they have been able to obtain at a discount on spot prices. There has also been fair inquiry for the spring months, but the firmness of makers has precluded first-hand business. Speculators, however, continue to offer abroad, but, buyers' ideas being below the level of spot prices, without much success.

Nitrate of Soda.

This article is firm at the advance, and spot prices are 8s. 7½d. and 8s. 10½d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Oct.* 24.

Tar Products.

The markets remain in about the same position, with a decidedly firmer tone as regards pitch and creosote. The former is in very strong demand for early delivery, and business has been arranged for July-December, 1903; while contracts are reported to be pending for delivery all over next year with consumers in South Wales. The position of anthracene remains the same; but transactions are very limited. Solvent and toluol continue in the same hopeless state. Consumers do not take any interest in either of these articles. Crude carbolic is firmer. For December only, 1s. 9d. has been paid; and makers now ask this price for January-March. A fairly good business has been done in 50-90 per cent. benzol at prices equal to 8d.; while the same figure has been declined for delivery all over next year. The demand for creosote continues strong in both London and the provinces, and prices have a decidedly upward tendency.

The average values during the week were: Tar, 18s. to 24s. 6d. Pitch, London, 54s. 6d. to 56s.; east coast, 52s. to 53s.; west coast, 49s. to 51s. Benzol, 90 per cent., 8¾d.; 50-90 per cent., 7½d. to 7¾d. Toluol, 6½d. Crude naphtha, 2¾d.; solvent naphtha, 7d. to 8d.; heavy naphtha, 9d. Creosote, London, 1⅜d.; North, 1¼d. to 1½d. Heavy oils, 2d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 9d. Naphthalene, 35s. to 45s.; salts, 22s. to 24s. Anthracene, "A," 1½d. to 1⅝d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is fairly firm for prompt; but there is not much business doing for forward delivery. The Gaslight and Coke Company have sold for October at £11 15s., and for November at £11 13s. 9d., and are reported to have declined £11 12s. 6d. for November-December. In Hull, business has been done at £11 13s. 9d. for prompt, and at £11 12s. 6d. for November. In Liverpool, several parcels have been placed at £11 15s. for prompt; but for November-December there is not much inquiry. In Leith, there is but little business to report. Prices are nominally £11 12s. 6d. to £11 15s.; but business is reported at £11 13s. 9d. for early shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The pressure of demand for housefire qualities which preceded and practically forced on the recent advance in prices, shows no really appreciable falling off; and collieries are being kept on full time, with the output insufficient to meet requirements—a good deal of stock being just now filled up to meet deliveries. As a result, prices are strong at the full rates; but whether there may be any further upward move will no doubt to a large extent be governed by weather conditions. For the present, any advance beyond what has already been put on is not in contemplation by colliery owners in this district. At the pit-mouth, prices remain at 15s. to 15s. 6d. per ton for best Wigan Arley, 13s. 6d. to 14s. for Pemberton four feet and seconds Arley, and 10s. 6d. to 11s. for common housefire coals. With regard to other descriptions of fuel, the general market position remains unchanged at rates averaging 8s. 6d. to 9s. at the pit mouth. The better sorts of engine fuel move away fairly well, and are generally firm at late rates—a considerable number of contracts having recently been placed for delivery over the next six or twelve months, on the basis of present prices. The lower descriptions of slack continue plentiful on the market; but there is not quite so much surplus output being forced for sale at low cut figures. The general tone, however, is not one of any great firmness; and at the pit prices for Lancashire slack remain 4s. 6d. to 5s. for common, 5s. 9d. to 6s. for medium, and 6s. 6d. up to 7s. for best sorts. The shipping trade is fairly good, with a trifle better prices still ruling, but 10s. 6d. to 11s. represents about full average figures for steam coal, delivered at the Mersey ports. All descriptions of coke continue in brisk request, and although prices are without really quotable change, there is a persistent hardening tendency where new business is offered.

Northern Coal Trade.

The ending of the demand for coals for strike needs abroad has given ease to the trade of the North, and prices of some kinds are lower; the whole market being quieter. The fall is most seen in steam coals, best Northumbrian steams being 11s. 6d. to 12s. per ton f.o.b., with a good demand for prompt delivery, but with only moderate orders forward. Second-class steams are from 10s. 3d. to 10s. 9d., and steam smalls are from 5s. 9d. to 6s. The gas coal trade meets now a growing demand; and as some of the collieries have rather

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MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
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MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.
The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
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heavy contracts on hand, best Durham gas coals are firm, and for early delivery rather scarce, the price quoted varying from about 9s. 6d. to 10s. 9d. per ton f.o.b., according to quality. New contracts are not very numerous at present; but the lower of the two prices is about the quotation for such for delivery over next year. Gas coke, though more plentiful, maintains its price—12s. 6d. being quoted as the f.o.b. value.

Scotch Coal Trade.

The miners' strike in the United States having come to an end, there is a slight slackening of prices; but as its effect while it was in existence was small, so it has been on its termination. There is an exception in the matter of price in the case of coal for domestic purposes, which, according to the season of the year, has been advanced 1s. per ton. The market may be said to have returned to its normal. The prices quoted are: Main, 9s. to 9s. 6d. per ton f.o.b. Glasgow, ell 9s. 6d. to 10s. 3d., and splint 9s. 6d. to 10s. The shipments for the week amounted to 273,426 tons—an increase of 16,126 tons upon the preceding week, and of 52,152 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,691,428 tons—an increase of 728,052 tons upon the same period of last year.

Gas Profits at Keighley.—The profits made by the Keighley Corporation gas undertaking for the year ended the 30th of June, after allowing for the lighting, &c., of the public lamps, amount to £12,718, from which have been paid interest on loans £2621, sinking fund £3419, renewals and insurance £2441, and other items; leaving a surplus of £3404. From this the Gas Committee recommend that £2000 should be applied in relief of the rates, and the balance carried to the working capital account.

Ceara Gas Company, Limited.—The Directors of this Company report that the result of the working for the year ending June 30 is a net profit of £2899 18s. 10d., which, added to the balance brought forward, gives a total of £3441. As no interim dividend was paid in April last, this sum is available for division. During the past year, the Company have again had to pay heavily for coals, and also for freight, and have, in addition, been most seriously inconvenienced through the continued inability of the State Government to pay the public lighting accounts when due. The amount owing at June 30 last was over £10,000. The fittings business of the Company, it is stated, is still suffering from the bad condition of trade, brought about by the prolonged drought, from the effects of which the State of Ceará is gradually recovering. The Directors recommend the declaration of a dividend for the year of 10 per cent. on the preference shares (less income-tax), and of 4 per cent. on the ordinary shares (tax free), making together £2754. It must, however, be understood that, though the dividend has been earned, it is impossible for it to be paid until the amounts owing by the State Government are received from Ceará. This remark also applies to the dividend declared in October, 1901. The balance carried forward will be £686 10s. 4d.

Malvern Water Supply.—The Malvern District Council last Wednesday had before them the report of their Engineer and Surveyor, Mr. H. P. Maybury, on the water supply of the town. In reviewing the improvement schemes suggested, he gave the following, with the approximate estimated cost of each: Artesian well at the Malvern Link Gas-Works, £9500; Bromsberrow (Bury Mill), £17,360; Grove House site, £18,926; and Newent (Gospel Oak), £29,400. It was resolved to instruct him to enter into negotiations with the different parties as to the land necessary for boring, and report to the Council at their next meeting.

Water-Works Scheme for Bath.—A special meeting of the Bath Town Council was held last Tuesday, when Mr. J. E. Hensham (Chairman of the Water Committee) moved the adoption of their report recommending that £44,000 be expended on the water supply of the city. This, he explained, would enable them to obtain additional springs in St. Catherine's Valley, estimated to yield 180,000 gallons a day at the driest period of the year; provide a collecting-tank and small storage reservoir for the purpose of equalizing the day and night flow; a branch main to Batheaston, so that all the water now running to waste there in the wet season could be brought into the city; and also a new main from Batheaston to Beechen Cliff. This, he said, would place the supply in a safe position for several years to come, and if later a large reservoir at Ayford were found to be necessary, the scheme could be completed at a total cost of £90,000. The works recommended would entail an annual charge of £1700, or about half the profits now made; but it was not justifiable to make year after year a profit out of the undertaking, and leave consumers with a short supply. The consideration of the report was adjourned.

Pateley Bridge Water Supply.—A meeting of the water consumers and property owners of Pateley Bridge was held in the Board School in that town a few days ago, for the purpose of receiving the report of a Committee appointed at a previous meeting to examine the various sources of water supply. Mr. A. Thorpe (Secretary to the Committee) read the report, which was to the effect that the Committee examined the existing supply on the 8th of October. The quantity of water flowing into the tanks on that date was 20,160 gallons per 24 hours, which, but for two unaccountable leakages in the pipes above the tank of 2880 gallons per 24 hours, would have been increased to 25,920 gallons. They considered the supply very good, as it would allow 122 gallons per day to each of the consumers. They were of opinion that the lack of water in the town was due to leakage and the waste in the mains and service-pipes. In August, 1898, the leakage was tested, and found to be about 17,000 gallons per 24 hours; and as there had been practically no repairs executed since then, the same, or even worse, conditions must exist. They suggested that before putting the township to great expense the mains and service-pipes should be overhauled and repaired, and that a man should be appointed to periodically examine the taps, &c. A very stormy discussion followed, and eventually it was decided that the report should be sent to the District Council for their consideration.

The Success of Last Season.

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Reduction in Price.—The Gas Committee of the Workington Town Council have recommended that the price of gas be reduced from 2s. 11d. to 2s. 8d. per 1000 cubic feet.

The South Metropolitan Gas Company and their Testing-Places.—At the meeting of the London County Council to-day, the Public Control Committee will report, with regard to the delay in the opening of the gas-testing places at Hill Street, Peckham, and Blackfriars Road by the South Metropolitan Gas Company, to which reference has already been made in the pages of the "JOURNAL," that a communication has been received from the Board of Trade intimating that proceedings are about to be instituted against the Company, under section 45 of the Metropolis Gas Act, 1860, for not conforming to the prescription of the Metropolitan Gas Referees with regard to the service-pipes at their testing-places.

The Proposed New Gas-Works for Bingley.—The Bingley District Council, at their meeting yesterday week, had before them the scheme for erecting new gas-works at Dowley Gap, which the Gas Committee recommended should be placed before the ratepayers. The estimated cost of the new works was £52,000; and on the minute coming up for discussion, most of the members expressed their unwillingness to commit the town to the expenditure of such a large sum, in view of the possibility of electricity coming rapidly to the front. Three schemes were considered by the Committee. The first was the repair and extension of the present works, at a cost of £46,000; the second, the erection of new works at Dowley Gap, at a cost of £52,000, including £4000 for railway sidings, which it was thought might be reduced; and the third, new works at Dowley Gap, with water carriage, at a cost of £49,000. In the result, the recommendation of the Committee that the second proposal should be put before the ratepayers was rejected by 12 votes to 4. Presumably, therefore, the Committee will now proceed to consider the question of taking the necessary steps for repairing and extending the existing works.

Fire at the Guildhall.—The festivities at the Guildhall last Saturday on the occasion of the luncheon to which their Majesties the King and Queen had been invited by the City Corporation, were unfortunately followed by what might, but for prompt attention, have been a very serious conflagration. A short time after the Royal guests had left, and while some of the company were still in the hall, sparks were seen dropping to the floor from the roof. An alarm was at once given, and initial operations were commenced under the direction of Major Fox, of the Salvage Corps, by the men of the Corps and the Guildhall firemen. Captain Wells was promptly on the scene, and powerful steamers were set to work in Basinghall Street. The fire originated in the ventilating-shaft of the gas-lantern, and the supposed cause, as stated by Captain Wells in his official report, was "overheating of the gas-light." The shaft was damaged by fire and cutting away, and the contents of the hall under it by water and dirt. But, happily, this appears to have been the extent of the mischief. A number of officers and men remained on the scene all night, and they were engaged there on Sunday evening.

Fatal Geyser Accident.—An inquest was held at Islington last Tuesday, by Dr. Danford Thomas, on the body of a young lady named Josephine Lege, who died in the bathroom at her father's house on the previous Friday. An hour after she retired to the room for the purpose of taking a bath, she was heard moaning, and on the door being forced was found dead upon the floor. A gas-geyser was used for heating the water; and the window of the room was closed. The medical evidence was to the effect that death was due to asphyxia, owing to the geyser having absorbed all the oxygen contained in the air. Having duly considered the circumstances of the case, the Jury returned a verdict of "Death from misadventure."

Discontinuing a Supply of Water by Meter.—In the Lord Mayor's Court, a short time since, the Recorder (Sir Forrest Fulton) and a Jury were engaged in hearing an action which had been brought by Mr. Benjamin Skelton and others, the Executors of the late Mr. Benjamin Skelton, to recover damages from the East London Water Company for wrongfully depriving them of their supply of water. The plaintiffs alleged that the Company had wrongfully removed a meter and discontinued the supply at the testator's late residence, Woodside, Essex. It appeared that Mr. Skelton had entered into a written agreement with the Company by which they were to furnish him with a supply of water by meter. The Company pleaded that the rates had not been paid as provided by the statute, and, further, that the contract had come to an end by the death of Mr. Skelton. The plaintiffs contended that the provisions with regard to the payment of rates in advance, and so on, did not apply to the present case, because the parties had entered into a contract which was outside the statute. They also urged, with regard to the agreement being put an end to, that the Company had, subsequent to the death of the testator, received from the Executors payment for water supplied, and that, consequently, they were estopped from raising the point as to the termination of the agreement. The death took place on July 13, 1901. The Company were paid for water until the 27th of November following, and on the 15th of April last they, without any notice to the plaintiffs, removed the meter and discontinued the supply, giving as a reason that they were entitled to do so because the house was empty. They subsequently offered to reinstate the meter upon the plaintiffs signing an agreement similar to the one which had been in force with the testator, and paying 12s. 6d. This offer was declined, on the ground that the original agreement was then in force. Mr. Ram, for the defendants, urged that, as the Act provided for penalties in the event of the Company failing to supply water to any person entitled to it, the plaintiff's proper remedy was to enforce those penalties, and therefore the action would not lie. Mr. Lewis Thomas, who appeared for the plaintiffs, contended that penalties could not be enforced under the special contract entered into between the parties. The Recorder, on considering the arguments, held that the plaintiffs' proper remedy was to have proceeded for penalties; and at his direction, the Jury returned a verdict for the defendants. A stay of execution was granted with a view to an appeal.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD.	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA.	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE.	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000

	Cubic Feet Daily.
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON.	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN.	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
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Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft. TORONTO (3rd Cont.), 750,000 C. Ft.

LOCAL AUTHORITIES (BILLS IN PARLIAMENT) BILL.

In the House of Commons last Tuesday,

Mr. GRANT LAWSON moved the second reading of the above Bill, the object of which is to amend the Local Government Act, 1888, by empowering County Councils to promote Bills in Parliament, and also to amend the Borough Funds Act, 1872. He explained that it made changes in the law which had been urged upon successive Governments by private members on both sides of the House. County Councils had now power, under the Act of 1888, to oppose Private Bills in Parliament, but not to promote Bills; and it was impossible to have a great county scheme for any purpose if a Bill in Parliament was required to carry it out. Clause 1 gave to the County Councils the same power to promote Bills as was possessed by Borough and Urban District Councils. The second part of the Bill dealt with some amendments of the Borough Funds Act of 1872. Under that Act, a Borough Council or an Urban District Council had to obtain the consent of a meeting of owners and ratepayers to the promotion of, or opposition to, a Private Bill in Parliament, and a poll might be demanded by a single owner or ratepayer present at the meeting. If a poll was demanded, it was taken by means of voting-papers left at the houses of the electors, and subsequently collected. These were defects in the law which the Government wished to amend. They proposed to continue the requirement of the consent of the electors as a check upon the desire to promote Bills. There was to be a public meeting of the parochial electors, at which the chairman might be required to put the Bill to the meeting in sections, instead of putting it as a whole, as at present. It was also proposed in the Bill that a poll might be demanded within ten days by not less than 100 parochial electors, or one-twentieth of the electors, whichever might be the smallest number. With regard to the opposing of a Bill, the opposition might require very short notice, and with the present complicated machinery, requiring 21 days' notice and a meeting of the owners and ratepayers, it was sometimes difficult for a council to oppose a Bill which they thought ought to be opposed in the interests of their constituents. The Government proposed that, as the opposing of a Bill was not a very costly matter, the meeting of owners and ratepayers, or of the parochial electors, should be dispensed with. The Bill did not give any additional subjects for Private Bill Legislation, and did not increase the prospects of a large amount of money being spent on the promotion of Private Bills.

Mr. CALDWELL congratulated the Government upon at last giving powers to County Councils which had long been possessed by the smallest borough in England.

Sir A. ROLLIT said local authorities were indebted to the Government for this real reform in local government. He was glad the Bill retained the principle of holding a public meeting, which would be a more effective check in the future than it had been in the past. The improvement in the method of demanding a poll would prevent unnecessary expenditure, and it would be a great advantage that a part of an "omnibus" Bill might be objected to.

Mr. H. HOBHOUSE thanked his honourable friend for having at last given effect to the wishes of County Councils to promote Bills in Parliament.

Mr. POWER thought there were many provisions in the Bill which would be very useful in Ireland. He did not see why the Bill should not apply to that country.

Mr. LONG explained that legislation of the kind proposed had always been confined to the part of the country affected by the Acts it was suggested to amend. He had no objection to the extension of the Bill to Ireland, and if the honourable gentleman proposed it, he should consult with his right honourable friend the Chief Secretary, and be guided by his views.

The Bill was then read a second time.

Messrs. Biggs, Wall, and Co. have received an order for an installation of two of their charging-machines for the Swindon United Gas Company.

The Stettiner Chamotte-Fabrik Actien Gesellschaft (vormals Didier) have been awarded a gold medal—the highest distinction—for their exhibit at the Düsseldorf Industrial Exhibition, which closed on Monday last week.

Our readers may be reminded that Mr. Alfred Richards will afford them an opportunity to-morrow, at the Mart, Tokenhouse Yard, of acquiring an interest in the West Ham Gas Company, the Directors of which have instructed him to offer for sale 2400 fully paid £10 ordinary shares, or such number as, with the premiums, will realize £27,988 9s. 6d. These shares rank for a standard dividend of 7 per cent. per annum, subject to the sliding-scale; and the last dividend on similar shares was at the rate of 6½ per cent.

The New Expanded Metal Company, Limited, of York Mansions, Westminster, and West Hartlepool, have issued a new "Handbook of Practice, Tests, and Tables of Approved Formulæ," relating to the employment of expanded metal in concrete, plaster work, &c., including fire-resisting and other buildings. The application of this system in the construction of retort-houses, reservoir roofs, water conduits, &c., is illustrated; and a list is given of some of the buildings and works in the United Kingdom and abroad in which it has been employed for various structural purposes.

By an announcement which appears elsewhere, it will be seen that the New River Company are inviting tenders for a large issue of 3 per cent. debenture stock, authorized by the Local Government Board for the execution of works of intercommunication under the provisions of the Metropolis Water Act, 1899. The object and extent of these works will be appreciated by the extract from the last annual report of the Local Government Board which will be found in our "Miscellaneous News." The stock is redeemable at par after the expiration of 25 years from the date of issue. The reserve price is £97 per cent., and tenders are to be delivered before 10 a.m. of the 13th prox.

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the old methods of Heating

by Steam and Hot Water.

There is absolutely no odour.

Made in Five convenient Sizes.

Full Particulars on application to

JOHN WRIGHT & CO., ESSEX WORKS, BIRMINGHAM.

Last Friday, a 36-inch water-main belonging to the Southwark and Vauxhall Water Company burst close to the works at Hampton, where some alterations were being carried out. The burst took place in a pit 10 feet deep and 20 feet wide, which had just been dug; and two men who were in the pit at the time narrowly escaped being drowned.

Readers of the "JOURNAL" are aware of the crusade which has been carried on by Mr. Joseph Store against electric lighting for Louth. He is now appealing to the ratepayers to elect next month only those candidates who hold correct views on the question of municipal electricity for such a town as theirs; and he has gone to the trouble of issuing a poster giving a list of the towns—109 in number—where undertakings belonging to local authorities have incurred losses, ranging from £22 up to £6485, after providing for interest, sinking fund, &c.

Under the title of the United Kingdom Lighting Trust, Limited, a company has been formed with a capital of £50,000, in £1 shares, to adopt an agreement with J. E. Evered, and carry on business as manufacturers of all kinds of lighting and heating appliances, as general engineers, and as suppliers of gas.

The works, offices, and show-rooms of the Watford Gas Company being situated at Bushey, it has been found necessary to have a show-room and collector's office in the town of Watford itself; and centrally situated premises have been taken in the High Street for the purpose. Here there will be a large show of stoves, fittings, incandescent and other burners, mantles, globes, &c. The show-room will be in the hands of an experienced attendant capable of advising customers; and competent workmen will always be on the premises.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

ASSISTANT-ENGINEER. Melbourne Gas Company. Oct. 31.
GAS-FITTERS. Cleethorpes Gas-Works.
GENERAL FOREMAN. No. 3934.
MAIN AND SERVICE LAYER. Cleethorpes Gas-Works.
MANAGER. Longridge Gas-Works.

SITUATION WANTED.

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